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EDITORIAL NOTES—GAS, &c.

Chemical Aspects of the Chief Inspector's Report.

THE further study of the last annual report of the Chief Inspector under the Alkali Act, copious extracts from which will be found in the present and two preceding issues of the "JOURNAL," in no way tends to diminish the impression of the value of its contents to those engaged in gas manufacture and the like industries. General reference has already been made in these columns to Mr. Forbes Carpenter's "Studies in Carbonization;" but many other portions of the report contain matter of the highest interest from the chemical point of view. The study of the composition of ammoniacal liquor from different sources, which has formed a prominent feature of the report for some years, was much interfered with during the past year owing to the increased demands on the time of the Chief Inspector and his assistants, due to the widening of the scope of their operations by the Alkali Act of 1906, and also by reason of the unfortunate delay in filling up the vacant Inspectorship in one of the most important districts. Such information as is given is of exceptional interest, including as it does analyses of the liquor obtained from the Woodall-Duckham vertical retorts at the Bourne Valley and Poole Gas-Works, and also from Mr. G. R. Love's 45° retorts at Guildford. In accordance with anticipation, it was found that the quantity of cyanogen compounds in the liquor from the latter retorts was low. But, quite unexpectedly, that obtained from the most recent installation at Poole showed a high cyanogen content; and an examination of the gas, made at Mr. Carpenter's suggestion, disclosed that the quantity of hydrocyanic acid there was similar to that usually found in gas made in horizontal retorts.

This unlooked-for result, which has already been referred to in connection with the Chief Inspector's "Studies on "Carbonization," raises interesting questions as to the truth of the view now usually held—that the hydrocyanic acid is a high-temperature product only formed by the action of ammonia on the incandescent coke. At any rate, it seems to suggest that this is not the only method by which this compound is produced in the retort; and Mr. Carpenter records the suggestion made by Mr. W. H. Coleman that it may also be formed by the action of ammonia on marsh gas as well as on carbon. That it may be formed by the action of ammonia on hydrocarbons seems quite possible. In view, however, of the comparative stability of marsh gas, this seems perhaps the most unlikely hydrocarbon to be attacked; and it is much more probable that the less stable unsaturated hydrocarbons would be the ones affected. Professor Bone, in his recent lecture to the Institution of Gas Engineers, advanced the hypothesis that, in the thermal decomposition of the hydrocarbons ethylene and acetylene (and the same would be true of the other more complex unsaturated hydrocarbons), simpler substances of the formulæ $\equiv CH = CH_2$, $- CH_3$ are first formed, which are incapable of more than transitory existence, and either combine with each other to form new hydrocarbons, or with hydrogen to form marsh gas; and if ammonia is present, as is always the case in the retort, it is quite conceivable that this would also react with these active hydrocarbons, yielding hydrocyanic acid. Definite proof of the method or methods of its formation must, however, await further experimental work. But it may be pointed out that in the Woodall-Duckham retort, in which the high cyanide formation has been observed, the highest temperature is maintained at the top, which may be a factor in the case; and it will be very interesting indeed to see what results are obtained with respect to cyanides in the Young-Glover continuous retort, where the highest temperature is maintained at the bottom.

The same substance, hydrocyanic acid, or rather the sulphocyanide to which it gives rise, crops up in another connection in the report, where the Chief Inspector deals with the difficulties now often experienced in the disposal of spent ammoniacal liquor containing large quantities of sulphocyanide and phenols, which are on this account objected to by local authorities in their sewage—more especially where bacterial processes are employed for its treatment. This difficulty is an increasing one, and any method of overcoming it will be welcomed by conductors of gas undertakings as well as by local authorities. After referring to the investigations carried out by Professor Frankland and Mr. Silvester at Oldbury, where the problem is perhaps more acute than elsewhere, Mr. Carpenter describes the experiments made by Dr. G. J. Fowler, the Chief Chemist at the sewage works of the Manchester Corporation, which appear likely to form a real solution of the problem. Dr. Fowler's method is to acclimatize sewage bacteria to the enjoyment of sulphocyanides and phenols as their daily food, and thus effect the removal of them from the still effluent before its admission to the sewers. The experiments made during the past three years at the Bradford Road Gas-Works, Manchester, have shown that very considerable success can be obtained in this way; and doubtless the results will be still further improved as experience is gained. It appears that an essential condition of success is that the liquor must be largely diluted before treatment; but Dr. Fowler has found that the treated effluent itself may be used for this dilution, which materially lessens the working costs. The tests made at Bradford Road, over a period of nine months ending in February last, showed that the oxygen absorbed by the liquor (which is chiefly brought about by the sulphocyanides and phenols present) is reduced by the bacterial treatment from an average of 250 grains to one of 22 grains per gallon; the maximum figure obtained during this long period in the treated liquor having been 51 grains.

A further matter discussed in the report is the delicacy of the lead-paper test for sulphuretted hydrogen, and especially the extent to which this is affected by the presence in the gas of sulphur dioxide; the result being given of an experimental investigation which shows how markedly the staining effect of sulphuretted hydrogen is checked by the presence of even such small quantities of sulphur dioxide as half-a-grain per cubic foot. This is a matter of considerable importance in testing the exit gases from a Claus kiln or chimney gases; but, fortunately, it does not affect the test so far as its use in testing the proper purification of coal gas is concerned, as no sulphur dioxide is there present. The figures obtained by Mr. Carpenter in his experiments, in the absence of sulphur dioxide, are generally in agreement with those of previous investigators, except that the sensitiveness of the test is found to be somewhat less; the increased delicacy obtained by moistening the paper with ammonia before use and of allowing the gas to impinge on the surface of the test-paper and not merely to pass over it, being fully confirmed.

Examination Development.

THE last few years we have had our attention directed somewhat frequently and prominently to the question of affording educational facilities for the realizing of greater proficiency in the art and practice of gas manufacture, supply, and utilization; and looking around to-day, we feel in a measure satisfied with the improved means offered by the universities, technical schools, and polytechnics of the large cities and towns for obtaining the rudimentary grounding that is essential to the highest technical efficiency, though the fact remains that in at least one quarter the response to proffered opportunity has not yet been very encouraging. There are reasons for this that do not call for prolonged search or for specification. On the other hand, there are opportunities offered that have had very encouraging response; and, looking behind the scenes, we find that where this happy condition prevails, the active force in bringing it about has emanated from within the gas industry. By the instrumentality of co-operation and personal influence much can be

and has been done; and any ignoring of these factors points to an imperfection in organization.

The growth of these facilities is a change welcome and beneficial; and it increases the importance of examinations, and the necessity for those examinations being altered in character from those that obtained and sufficed in days now passed. There has been development in the character of the recognized examinations; but even now, as the writer of the articles that have appeared in our last two issues on the "Examinations in 'Gas Supply'" has remarked, "the "method of ascertaining the relative merits of candidates "by time-limit examinations is far from perfect. Up to the "present, however, no more practical method that is capable "of anything like practical application, has been evolved." Absolute perfection cannot be expected in examinations, any more than it can be in the examiners or in the candidates; and there must be a little give-and-take elasticity on all sides. But we are afraid that the "give" has, speaking generally, been in the past more often on the side of the examiners, and that they, on their part, have had to "take" a fair amount of abuse. At the same time, in years gone by the complaint has not been altogether groundless that examiners in Gas Manufacture, in connection with the Technological Department of the City and Guilds of London Institute, have shown a lack of appreciation of the fact that the candidates before them are students of comparatively limited years of experience; while other examiners have been far too lenient. It is difficult in this, as in many other mundane affairs, to strike the happy mean. However, all the more credit and honour to those who gained the distinction of prizes and certificates in the stiff examinations. On the other hand, the value of the credit and honour so won is distinctly discounted by the fact that others hold the same distinctions gained under less onerous and critical conditions. Now there is promise that the co-operation that has been established, at the instance of the retiring Examiner in Gas Engineering (Mr. A. F. Browne), between the Institution of Gas Engineers and the Department of Technology, will serve to evade the causes of complaint to which reference has been made, and will add value to the examinations, and lustre to the success of the candidates. This will, we firmly believe, be the result of the co-operation. Those in authority in the technical institutions scattered throughout the country at which opportunities have been provided for technical instruction specially suitable for students of gas manufacture, distribution, and utilization, should consider this well, and ask whether it would not be in their own interests to seek the co-operation, in an advisory capacity, of the District Gas Associations.

The first-fruit of the co-operation of the Institution of Gas Engineers with the City and Guilds of London Institute has been the separation—and the necessary separation—of the subjects of gas engineering and manufacture and of distribution and utilization. There was a tendency aforetime to somewhat neglect the latter branches, the importance of which had expanded to such a degree of late years that to continue on the old lines showed want of adequate recognition of the change that had come about, and to an extent veiled the importance of proper poise being given to the subjects in the curriculum of the gas student. That has now been altered; and the gas student who covets complete certification will not in future be satisfied till he has in his possession the attestation of qualification in the ordinary and honours grades of both gas engineering and gas supply. It was with some interest that we watched for the questions and the results of the examinations in "Gas Supply" in this the first year of these examinations; and there must be an expression of complete gratification, and of congratulation to the first Examiner in this special branch, Mr. John H. Brearley. The number of candidates who presented themselves for examination on this first occasion is significant of a desire to obtain the special certificates in this branch of professional knowledge; and it gives assurance that henceforth distribution and utilization will be regarded as subjects meriting special study and thought, and not as subjects a sufficient acquaintance with which can be picked up by the way. Let us pause for a moment to point the fact that the position of Examiner in these qualification tests does not possess the character of a sinecure, nor does it appear to carry much laudation or honour; but it does involve a considerable amount of hard work in framing the questions, and in examining with care, discretion, and impartial judgment, the productions of the candidates. The last examination pass-lists we have published show that there were 155 successes in "Gas Engineering," and 140 in "Gas Supply;" but these figures do not take account of the candidates who were not successful. However, the successes show the fact that Mr. Browne had 155 papers and Mr. Brearley 140 papers, together with the papers of the candidates who did not pass, to critically examine. This work absorbs a vast amount of time, and demands a considerable amount of mental application in order that justice may be properly awarded.

This being the first occasion of a special examination in "Gas Supply," it is not out of place to make complimentary reference to the obviously high plane on which the Examiner has inaugurated the examinations. The questions put to the candidates show a full appreciation of the importance of small things, as well as the necessity of knowledge tests in regard to the higher technical aspects of the subjects. The work has been entered into with seriousness and personal interest; and, as a consequence, we look with confidence to an increasing recognition of the utility of this test of knowledge in this more-than-ever important department of the gas industry's work. It was not always so. But it is so now in many undertakings that at one time would not have thought of such a thing, that the work of the distribution and gas sales department is confided to a specially qualified official responsible to the gas engineer and manager; and such appointments in future will not need to go by favour but by proved ability. The certificates in the ordinary and honours grade of "Gas Supply"—particularly the first-class ones (of which we want to see more in both divisions)—will be passports to such positions; and therefore they will be, we do not doubt, greatly coveted. By the time Mr. Brearley gives up the work that he has taken in hand, the position of Examiner in this particular department will not, if the numbers of candidates increase, as it is expected they will do, be one that will be lightly taken in hand by anyone. It will require beyond the honour, such as it is, attaching to the office, a love for the work, and a feeling that duty calls. The next examinations in "Gas Engineering" and "Gas Supply" will be on April 24 and May 1, 1909, when Mr. W. Doig Gibb, the ex-President of the Institution of Gas Engineers, will commence his work as Examiner in "Gas "Engineering," and Mr. Brearley will again be the Examiner in "Gas Supply." To the candidates, the articles on the recent examination into the latter subject that have appeared in the last two numbers of the "JOURNAL" will be exceedingly valuable. They were communicated for publication; and a pen moved by ripe experience drafted the answers to the questions put in the first "Gas Supply" examination. Of this we feel sure, that many besides the 140 successful candidates have perused these questions and answers with much avidity. For the heavy work involved, we thank our contributor; and trust that its influence will be as fecund as he desires.

Behind Germany!

THE German gas industry, more particularly the German Association of Gas and Water Managers, are to be heartily congratulated on the healthy and vigorous condition in which the instructional and experimental gas-works at Carlsruhe are found to-day. Germany has taken a lead in this matter that should put to shame the gas industry in this country. Here we have been talking of the necessity of such an establishment almost as long as a large majority of the gas professional men of to-day have been identified with the industry; but progress has not been made beyond the talking stage. Only last week the idea was revived in our "Correspondence" columns; but it is feared that it is only brought to light to have another span of oblivion between it and the next revival. Why has Germany succeeded in this matter while we have not? There are two reasons that spring to mind without the aid of a microscopical examination in the investigation of causes. The German gas industry has had a leader in the matter in the learned Dr. Bunte, one of whose innate virtues is that he knows what to do, how to do it, and when to do it; and, when he has made up his mind on the matter, and finds that his faith has proper balance with reason, he sticks to it. The other cause for the successful issue of the scheme is that the gas industry of Germany has a keen comprehension of the times when it is against their interest to be parsimonious. Here, in the effort to obtain money for the purposes of the gas industry, the voice of the pleader is heard; and there is practically an end of the matter. After the first few have responded, an insistent spirit may get some further

funds in dribbles. But it is all painfully slow; and to have ultimately to resort to squeezing to make both ends meet is a very undignified position.

The answer to the plea for an experimental works for the British gas industry has often been that many of the large gas-works have their experimental plants, and that they are sufficient. They are not. No gas-works can give in its experimental work that formal, constant, persistent attention that is requisite to solve, prove, and attest, nor undertake the variety of work that would fall to a special experimental plant, and such as has already fallen to the fortunate Carlsruhe plant (as shown in the report elsewhere) during the first year of its operation. The initial work that, under the supervision of Dr. Bunte, was undertaken was one that, in dealing only the other week with Mr. W. Doig Gibb's address to the Institution of Gas Engineers, we suggested sadly requires to be carried out in this country, and that is the revision of the published tests of gas-making coals to show the capabilities of those that are available at the present time. A systematic examination of the German gas coals has been entered upon at Carlsruhe. Some 28 varieties have already been tested; and the results are to be collected and published. We shall stand somewhat abashed if presently from Carlsruhe come the results of exhaustive tests of the British coals available for gas-making purposes to-day. We shall not complain; full credit will be theirs. But nevertheless the reproach and the indebtedness will be on our side. The questions dealt with during the year at the experimental works refer to so many aspects of the manufacture and applications of gas that we will not enumerate them here. Among other things, the works staff have been engaged on confirmatory tests of the working results of the Dessau vertical retort-settings at the widely separated scenes of activity and experience—Mariendorf and Zurich.

The experimental gas-works at Carlsruhe are linked up very closely with the Technical Institute; and thus there is an amalgamation that offers the most complete association of scientific and practical methods, as it were under one roof, in the training of gas engineers and chemists that has ever been conceived and carried to a successful issue. But, of course, experimental works such as those at Carlsruhe, with definite objects and exactitude in method, cannot stand as the equivalent for works' practice. For the novitiate, there could be nothing better in the preliminary stages of training. We will not ask why we have not the like in this country; the answer is too well known. A question more pertinent is, Is there any chance of ever having the like?

Gas Shareholders as Councillors.

THE whirligig of time brings its changes. Thirteen or fourteen years have passed since, in the exigent interests of electricity concerns, the question of the right of gas shareholders serving as local councillors to vote upon matters affecting applications for electric lighting powers or the employment of electricity for public lighting was being debated inside and outside Council Chambers with as great an eagerness as would be some momentous political issue. The opinions of lawyers were freely obtained; and in the "JOURNAL" for Dec. 10, 1895, some of them were published. Looking at these opinions to-day, the names of Sir Richard Webster, Mr. R. W. Wallace, Mr. R. S. Wright, Mr. H. H. Asquith, and Mr. G. Humphreys are found. From among these, we have now a Prime Minister and a Lord Chief Justice, and have had another Judge of the High Courts. However, the question has been lifted to the surface again at Tunbridge Wells, in connection with the public lighting; and Mr. F. E. Cooper, of the Gas Companies' Protection Association, in our "Correspondence" columns to-day, puts before gas shareholders who are members of municipal corporations an aspect of the matter that does not appear, from the published opinions, to have been considered by Counsel in 1895. Counsel then seem to have confined themselves to, and based their opinions upon, section 22 (sub-section 3) of the Municipal Corporations Act of 1882, and section 46 of the Local Government Act of 1894. The latter does not apply to the proceedings of the Council of a borough; and, as to section 22 of the Municipal Corporations Act of 1882, Counsel in 1895 appear to have overlooked the exemption provided by section 12. Mr. Cooper points out that this section specially provides that a shareholder in a Gas Company contracting with a council for lighting shall not be disqualified as a councillor, or be deemed to have any share or interest in such contract, by reason only of his having any share or holding in the Company so contracting. Therefore, it is the opinion of Mr. Cooper and the Committee of the Association, that a gas shareholder who is a member of a municipal corporation is entitled to speak, and, if he wishes, to vote, upon the question of public lighting whether by gas or electricity or otherwise. This makes section 22 somewhat uninteresting to gas shareholders who are members of municipal corporations. Members of urban and rural district or parish councils are in a different position, as section 46 of the Local Government Act, 1894, specifically prohibits a member of these lesser bodies who is a shareholder in a concern having a contract with the local authority voting upon any question in which such company are interested; but the County Council have the power to remove the prohibition. In the case of such urban, rural, or parish councils, why should not gas shareholders endeavour to get the County Council to remove the prohibition when necessary? In the case of municipal corporations, the governing Act itself does all that is needful. Interest in the matter comes up again in connection with the renewed attempts which are now being made to render support to electric lighting undertakings, in a manner detrimental to the interests of the ratepayers, through the public lighting.

The Corporate Outcast.

ALTHOUGH the Municipal Franchise (Mercantile Corporations and Companies) Bill—a title which shows the object of the measure—has passed the second reading in the House of Lords, it is as good as dead. The Government will not support it. Of course they will not, because they see in it the opening of the door to additional power being exerted against their pet domestic policy of municipalization. It is the only discoverable excuse, though a democratic Government such as the present one ought not to object to a measure that broadens the suffrage base by the inclusion of companies who, in the large cities, bear at least one-third of the local rates. But rather than give to these companies the right possessed by every householder large and small—including compound householders—the Government would perpetuate the long-standing infraction of the old principle that taxation and representation should go together. If the Bill reaches the Lower House, there will be an intractable opposition there, as there is already outside, on the part of those who are ever ready to take the defensive when they fancy they discern a threat to do some manner of violence to their sacred municipalistic doctrines. But it strikes us that the fury raised is altogether out of keeping with the ridicule that is in the same breath thrown upon the value of the right to a single vote on the part of commercial companies and corporations. If there is no value in the single vote, then the conferring of the right can do no harm; and if the possession of a harmless vote will really mollify these important ratepayers who at present feel an injustice in being left out in the cold when they supply so much of the fuel, then why not accept without any demur such an easy way of appeasing them? It is manifest that it is something more than this that agitates the municipalizer every time this question of votes to joint-stock concerns is mentioned. Granting the right to vote would be but an act of justice; the exercise of the vote would have influence. There is a depth of meaning in Lord Avebury's words that votes must be weighed as well as counted. While we cannot be otherwise than perfectly at one with the Lord Chancellor in his profound declaration that the individuals composing companies have votes in their private capacities as householders, we do submit that this is not the equivalent of the possession by a company of the right to exercise a vote in the district or districts to the local funds of which they are compulsory and heavy contributors. It does not follow that the individuals of a company holding the right to vote in their private capacities are resident in the area in which the business property may be situated; and in such cases their private votes cannot represent the interests of the business concern. The vote of the individual, too, only represents his personal ideas, which may not harmonize with the best interests of a corporate body. Every such joint-stock enterprise should be in a position to take part and interest in local affairs, through a representative instructed by a majority of the Board. Such companies are in an anomalous position; and the importance of removing the anomaly becomes greater year by year.

The Gas Heating Field.

In recent numbers of the "JOURNAL" attention has been drawn to the results achieved by corporation gas undertakings; and in this connection, mention must not be omitted of the Huddersfield Corporation Gas-Works, the figures relating to which for the past decade are certainly creditable both to the Committee and to their Engineer, Mr. Edward A. Harman. A reference to the short article contributed by Mr. Harman to the issue of the 7th inst. (p. 33) will show clearly the great strides that have been made in the consumption of gas during the period named. In the ten years 1899 to 1908, the total gas sold, exclusive of that used on works, has increased 46·3 per cent.; while Mr. Harman's analysis shows that in the same time the quantity sold for stoves, fires, engines, &c., has increased by 186·6 per cent. At March 31, 1898, there were in use (supplied by the Gas Department) 180 cookers and 58 fires; while on the same date this year there were in use 16,264 cookers, 1162 fires, and 835 wash-boilers. The actual effect of differential prices is here clearly seen; a difference of 9d. per 1000 cubic feet between the gas used for lighting and that employed for engines and stoves having been the practice at Huddersfield. The total increased consumption during the decade of 46 per cent. is apparently not to be accounted for by growth of population, inasmuch as at the last census Huddersfield revealed an actual decrease. It is fair to infer, therefore, that the increase has been principally due to the differential prices obtaining, and that householders fully appreciate the lower charge for domestic purposes. Looking at the figures set forth by Mr. Harman, it will be observed that, as already mentioned, the gas sold for motive power and stove purposes has increased practically 187 per cent. in the last ten years; or if half the gas used through prepayment meters be reckoned for stoves, the increase is 300 per cent. It is not often that these results are obtainable in the precise form shown; and for this reason they are the more interesting. It is only by dogged perseverance in attacking the problem, that gas-fires will be generally acknowledged as invaluable for domestic use, as are gas-cookers. The convenience of gas-heated coppers or set-pots is now generally understood. Though, of course, conditions differ, the Huddersfield figures do undoubtedly demonstrate in a practical manner what can be accomplished by a system of differential prices; and for this reason Mr. Harman's statement should receive due consideration by those undertakings that have not yet adopted the principle. It is worthy of note that during the past ten years the Huddersfield Gas Committee have been enabled to reduce their charges for gas by 9d. per 1000 cubic feet all round; while in the same time they have contributed to the relief of the borough rate £31,248. An old debt amounting to £48,587 has also been paid off in the same period; and in its place a depreciation and contingencies fund, now amounting to £35,067, has been formed. Not the least gratifying feature is that during the decade the capital—£322,655—has not been increased.

Laindon Pretence.

The Directors of the Laindon and District Gaslight, Coke, and Water Company, Limited, or rather those who remain associated with the concern, are making their annual appeal for capital. Poor little Laindon! If the prosperity of the straggling, struggling village could be measured by the capital requirements of 99, Cannon Street, for the provision of gas and water supply in the place, we should have no right to call it "poor" or "little." It was in April, 1906, that the first prospectus of the Company was circulated; it was in June, 1907, that the second one was distributed for further capital; it is in July this year that the third one comes out. When the first prospectus appeared, attention was called in the "JOURNAL," for May 29, 1906 (p. 562), to a miserable piece of deception on the part of the promoters. They claimed the existence of a Laindon Gas and Water Act, and of statutory powers under that hypothetical Act. There was a Laindon Gas and Water Works Provisional Order issued by the Board of Trade in 1896; but the gas and all other unexercised powers of that Order expired in 1899, in which year the then "Company" tried to get the gas powers revived and the water powers extended, but the Board of Trade declined. After this exposure in our columns, the promoters of the Company had less to say about the non-existent "Gas and Water Act" in their prospectus of 1907. But even then it was stated that the "10 per cent." ordinary shares were "limited to this dividend by the Laindon Gas and Water Act." In the present prospectus, the Directors are a little more discreet; and the false pretence of the possession of gas and water powers under a Laindon Gas and Water Act of 1896 is not made use of in attempting to abstract more money from the public for this concern. If there are any dissatisfied shareholders in the Company who care to go to the expense of moving their legal advisers in the matter, they should have the statements in the 1906 and 1907 prospectus investigated, with a view to securing a return of their money. The Directors are now Mr. H. W. L. Way, Dr. Allan Maclean, Mr. W. B. Martin, and Mr. E. Eaton. What has become of the other two who were on the Board when the 1907 prospectus was issued—Mr. F. W. Talbot, Managing-Director, and Mr. W. W. Barron, Gas Engineer? We are sorry to have to plead ignorance of any title on the part of the last-named gentleman to the description of "gas engineer;" but naturally we cannot be expected to know every person, high and low, associated, by right or fancy, with the gas profession. Last year Mr. W. J. Harrill was the "Works Manager" at Laindon; now we see that B. Rowlson, "Engineer," late of the Oswestry Gas Company (not as Engineer), signs the report appearing in the present prospectus.

Capital and Bait.

According to the present prospectus, the exposure there has been has not prevented the promotors and Directors from placing 657 6 per cent. preference shares of £5 each and 721 "10 per cent." ordinary shares of £5 each, together with £2930 of debentures—making a total of £9820. The "authorized" share capital is £12,000; and the "authorized" debenture issue—authorized under "a resolution of the Directors"—is £5000, which is above the present common statutory proportion of one-third of the share capital. Having secured £9820 for gas and water "works," about the size and character of which the Directors show a wise discretion in saying nothing in their prospectus, they are now asking for a further £7040 of capital (including £2070 of debentures) which will about exhaust the "authorization." And this £7000 odd is required, among other things, "to lay additional mains, and provide further meters and gas cooking stoves." If the Directors had said "and to buy up all Laindon" there would have been more sense than in the suggested lines of expenditure for the bulk of this £7000. In other respects, the prospectus is much the same as that issued last year—even to the number of building plots that have been disposed of in Laindon; so that there has not been development in this regard. The same tempting bait of a guaranteed two years' dividend is offered; but what is to come after? In the prospectus issued in June, 1907, it was stated that the gas-works were opened on May 27; and were working very satisfactorily. But in the present prospectus the Directors talk in the usual breezy style of the prime movers in these matters at No. 99, Cannon Street, without committing themselves to any categorical statement as to the position of affairs as the result of the past year's working. All they do say is that the Manager avows that, when the extensions are completed, the revenue "should be" £1000. Prudent man! The caution is worthy of the masters.

Contradictions.

In the 1907 prospectus, a report was published from Mr. Harrill, the then Works Manager. He asserted that he was arranging to supply the London, Tilbury, and Southend Railway Company's station "in accordance with the agreement you have entered into." A "Financial News" representative who visited Laindon last week incidentally mentions in an account of the investigation he made that, though the gas-works are within a stone's throw of the station, the Railway Company have decided to stick to the old-fashioned oil-lamp. On May 28, 1907, the Works Manager reported: "A supply of gas is now available for public purposes;" on May 20, 1908—a year later—the "Engineer" reports: "I have *now* the gas-works in full working order; and all the inhabitants are most anxious for a gas supply;" and last Thursday, the "Financial News" representative, in the course of his account of the visit to Laindon, makes these suggestive comments: "The famous gas-works turned out on inspection to constitute little more than a toy plant; but I should hesitate to say that they are not amply large enough for all present and future purposes. Laindon has taken over ten years to grow to its present size—the population to-day numbers about 800 souls

all told, and is probably stationary, if not dwindling. The gas-mains were only laid a month or two ago; and in the first rush of enthusiasm a few householders appear to have taken in the illuminant—on the penny-in-the-slot system. The actual price of the gas is 4s. 6d. per 1000 cubic feet." The anxiety of all the inhabitants for a supply does not show itself in the prospectus in statistics, or in any financial particulars as to the results of the working of the gas plant since May, 1907.

Manchester Electrical Exhibition and Home and Foreign Manufacturers.

The beating of the big drum has commenced over the Manchester Electrical Exhibition. The buildings are so far finished that a Press view has been held. The potency of the Press in exciting interest is especially recognized by exhibition promoters. The show (which opens on Oct. 3) promises, according to the Press notices, to be something worth seeing. One report assures us that the main "shed" is to be the largest of the kind ever erected; its measurement being some 500 feet by 180 feet. The reports do not agree on this point; some say "by 150 feet." But a strip 500 feet long by 30 feet is a matter of little consequence to the daily newspaper man. Already three-fourths of the floor space, it is reported, has been allotted to exhibitors; but it will not be consoling to the hard-pressed electrical plant and appliance manufacturer of this country to read that "the Continent is sending a not inconsiderable quota of appliances to range side by side with those built in the United Kingdom." It is a great pity this show in the very midst of the great manufacturing areas of the North could not have been run on British-made electrical goods alone, without the promoters calling in to their financial aid Continental makers. It is bad enough that the British electrical plant manufacturers should have to endure such cut-throat competition as they do among themselves; to have to endure on top of it, as they do, strenuous competition from abroad is worse; but to give facilities for the prominent advertising of Continental goods (by exhibition at the very doors of British factories producing electrical plant and appliances) is surely adding insult to the immense injury already done. However, perhaps we are making a mistake in this; for one of the exhibitors at the Press view (this was a maker of metallic filament lamps) said that, from an exhibition such as the Manchester one, exhibitors expected a great and beneficial result. So they did from Olympia. The money on that show was spent lavishly; complaint is still rife of bad and unprofitable business in the electrical industries, and several concerns are keeping their doors open still hoping that adversity will depart, and success as measured by profits will step in. Will the Manchester exhibition help to this end?

M.H. (Methane-Hydrogen) Gas Plant, Limited.

In the last number of the "JOURNAL" we recorded the formation of a Company under the above title, with a capital of £30,000, in £1 shares, to adopt an agreement with Messrs. Biggs, Wall, and Co. and Mr. C. E. Tully, whose names are associated with the invention and manufacture of the plant specifically referred to. The capital of the Company is divided into 15,000 participating preferred shares of £1 each, and a like number of ordinary shares of similar nominal value; and it will be seen, from an announcement which appears elsewhere, that subscriptions are being invited for the issue of the former shares at par. They are entitled to a cumulative preferential dividend of 10 per cent. per annum on the amounts paid upon them, also to half the profits remaining after a similar dividend has been paid on the ordinary shares, and, in addition, to one-half the surplus assets after repayment of the paid-up capital, in proportion to the amounts paid thereon. As our readers are aware, the gas produced by the plant of which the Company have acquired the patent rights is methane-hydrogen gas, the method of producing which has been fully described in the "JOURNAL," in the pages of which the results obtained with it have been duly noticed. Already plants have been erected at the Truro, Swindon (G.W.R.), and Hythe Gas-Works; and it is stated in the prospectus that the Railway Company have ordered a second plant of equal capacity (300,000 cubic feet per day) to the one now working. The "M.H." Company take over all contracts in course of execution, as from the 1st of January last, subject to the payment to the vendors of the moneys expended by them thereon. The subscription list opened yesterday, and will close next Saturday.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 191.)

THE Stock Exchange has had another disappointing week. It showed some animation at first, and brightened up into a degree of cheerfulness. But this soon came to an end, and the rest of the week was dull and almost despondent. It was account week, and therefore not free from some element of anxiety; and in sensitive lines it needed but little liquidation to knock prices down. The opening on Monday was distinctly fair; the gilt-edged division being firm and Consols rising ¼, while even Home Rails were not so bad. This tendency was maintained on Tuesday for the most part; Home Rails again showing a gratifying improvement. But Americans were shifty. Wednesday began with the previous day's influence still in force; and there was some fair investing in choice articles. But later on, the horizon was disagreeably clouded by a sharp fall in Home Rails, which were freely offered. On Thursday, pretty well everything was dull and flat; Consols falling $\frac{3}{16}$. Friday was heavy and drooping. Consols fell another $\frac{3}{16}$, though some buyers afforded support to other gilt issues, and Home Rails were still on the down line. Saturday brought no improvement. Consols were unchanged, but they were far from strong, and nothing showed any holding-on power but the Americans. In the Money Market, there was an abundant supply at easy rates; and the demand for the settlement could make no impression on it. Discount business was very quiet, and rates hardly moved. In the Gas Market, there was considerably more activity, in view of the nearness of the dividend season, coupled with a large number of advances in quotations. In Gaslight and Coke issues, the ordinary was very busy, and showed a steady tendency to improve, but the quotation was only drawn in closer. Transactions opened at 97; but the last half-dozen were all at from 98 to 98½. The secured issues were very quiet. The preference marked 106¾ and 107¾, and the debenture 84 and 84¾. South Metropolitan was actively on the rise; being done at 118½ on Monday, and 120 on Friday and Saturday. The debenture made 86 *cum div.* and 83¾ *ex div.* Commercials also were busier and stronger; the 4 per cent. changing hands at from 107½ to 110, the 3½ per cent. at 102½ and 104, and the debenture at 81½. The Suburban and Provincial group were as inactive as usual. Brentford old was done at 246, British at from 42⅛ to 42½, Hastings at 93 free, Tottenham "B" at 107½, and West Ham at 101¼ and 101½. The Continental Companies provided good business in Imperial at from 179½ to 182, Union was done at 112, European fully-paid at $23\frac{15}{16}$ *ex div.*, ditto part-paid at $16\frac{7}{8}$ *ex div.*, and Tuscan at 10⅜. Among the undertakings of the remoter world, Bombay was done at 6, Buenos Ayres at $11\frac{5}{16}$ and 11⅛, ditto debenture at 92, both Melbournes at 102⅛, Monte Video at 11½, Primitiva at 6⅜ and 6½, ditto preference at $5\frac{1}{32}$ and $5\frac{1}{16}$, River Plate at from $13\frac{5}{16}$ to $13\frac{11}{16}$, and ditto debenture at 91½.

ELECTRICITY SUPPLY MEMORANDA.

The Principle and its Breach—System of Charging—For the Time Being—The Refuse Destructor an Unwelcome Mate—Raiding via Railroads—Deceptive Lamp Rating—When Electric Lighting is Cheaper than Gas.

THE publication of the reports of the proceedings of the recent annual meeting of the Incorporated Municipal Electrical Association has been completed. The President for the year was Mr. H. Talbot, the Engineer of the Nottingham Corporation Electricity Department; and therefore the meeting was held at Nottingham. The address of the President was commendably short and pithy. He described the common ground on which the members met as being that of giving an efficient and cheap supply of electricity to all consumers and for all purposes, consistent with the principle that the long-hour consumer shall not be called upon to pay part of the cost incurred in supplying the short-hour, or, in other words, the non-profitable, consumer; and he assumed that one of the main ideas at these conventions is to strengthen and encourage one another in the efforts for this attainment. It is interesting to see that this strengthening and encouraging is merely an assumption of an idea; for, as a matter of fact, whatever seriousness may prevail in this direction at the meetings has been dissipated by the time many of the members have ended the railway journey home. The principle that the long-hour consumer shall not pay part of the cost of supplying the short-hour consumer, is, we are sorry to find, honoured as much in the breach as in the observance.

A pendent question is that of the system of charging for electricity; and Mr. Talbot is found to be unquestionably a disciple of Wright of "maximum demand" fame. In the President's view, the flat-rate system of charging is unjust; and a scale of discounts, increasing with the number of units consumed, only tends to aggravate the injustice. He hesitated, however, to enter into the labyrinth of reasons for and against—at least, we gather so from the abstract of the address before us—and so his postulation can only be examined in the light of known external facts. A scale of discounts, he asserts, aggravates the injustice. The injustice to whom? Surely not to the consumer, who, according to the magnitude of his custom, gains advantage in obtaining at a

progressively cheaper rate the electricity he needs. The injustice, as a matter of fact, falls only upon the electricity station, when the consumer of large volume is also a short-hour consumer. But what has this to do with the consumer? It is not his fault that the electricity station has no storage to enable the generating plant to work at a level line whatever may be the consumers' fluctuating demands; and he sees no reason why the ordinary principles of commerce should not apply to electricity, as in the case of all other commodities.

What will be the ultimate effect of the metallic filament lamp upon electricity undertakings? is a question that Mr. Talbot acknowledges the impossibility of answering, though he is one of those sanguine individuals who consider that the reduction of revenue from the new lamps can only be temporary, as the cheapening of the light will have the effect of "enormously" increasing the number of consumers, and so necessitate a larger output in the near future, although, "for the time being," it may go hard with contractors for electrical plant, as extensions will not be required so soon. The contractors for electrical plant have already, and for some years past, had a bad time of it; and it would have looked a little more merciful on the part of the President if he had just hinted that many electricity undertakings will be the companions of the electrical contractors in misfortune, traceable to the metallic filament lamp. Anyway, the prophesied enormous increase in consumers is not going to necessitate a greater output "for the time being" than the existing plant is capable of furnishing.

Mr. Talbot rakes up the old question as to the advantage of combining generating stations and refuse destructors; and he makes it pretty clear that, if he were not Engineer to a Corporation who have adopted refuse destruction in combination with the generating-station, he could say some particularly nasty things about the incongruity of the mating from the generating station standpoint. Of course, refuse has to be got rid of in some way; and the more economical and sanitary that way, the better. But it is a certain fact that "the handling and burning of the refuse alone costs more than the same output could be obtained for at a coal-fired generating-station." The President, however, takes the sting out of this latter declaration of the opinion that is within him by asserting that it would be a pity not to utilize the heat, even if, in so doing, the electricity undertaking be asked to contribute indirectly towards the expense of destroying the refuse. We are not disposed to agree with Mr. Talbot in this. There is no reason why the electricity undertaking should be at any loss over the transaction. Of course, the layman cannot understand where the loss comes in. Here is fuel, here is heat, here is steam. Then why not use it? The generating-station is a peculiarly constituted animal. If there is not enough work for it to do, the cost of running it per unit generated is very great; if at one part of the day, the demand shoots up high for a period, and then drops precipitately down again, the station does not like it, and the cost per unit is affected in an adverse manner by these flights. The electricity station does best when there are no deep valleys and no pointed peaks in the curve-line of demand. How, then, does the refuse destructor detrimentally affect the generating-station? The President tells us. It, of necessity, supplies cheap units at the bottom of the curve, and leaves to the main station the task of supplying the expensive ones at the top, with a consequent reduction of the load factor. And, again, a very little consideration shows that the higher the peak the load curve gets, so does the cost of supplying each unit generated increase out of all proportion. Those of the Tunbridge Wells town councillors—there are several of them—who know all about load factors, load curves, and so forth, should remember that the higher the peak the load curve gets through the public lighting coming on just as the more profitable private lighting is in full swing, so the cost of supplying each unit generated increases. Ask Mr. Talbot if this is not so.

The proposal of a non-statutory electricity supply company in Scotland to raid, *via* railroads, the districts of existing statutory suppliers of electricity—a matter to which we gave a little attention recently—is creating quite a ferment up North; and the suppliers of electricity are inquiring how they stand in the matter. The question was dragged into discussion at the meeting of the Municipal Electrical Association by a reference to the jettisoned proposal of the Great Eastern Railway Company in their Bill of this session, to supply not only themselves along their lines, but all premises requiring a supply connected to their system by sidings, and to local companies and authorities generally who might agree to purchase in bulk. The clause was curtailed so as to exclude the tenants of the Great Eastern Railway Company, and later it was relinquished altogether. Of course, railway companies, if they could obtain powers to generate electricity, and do this sort of thing, are in a peculiarly favourable position, with their lines threading their way through counties, cities, and towns, though, in doing this, they would be annihilating their present fuel traffic to the industrial factories concerned. Presently, however, as electrification of railway systems extends, railway companies will be looking into this question rather more largely than will gratify the local authorities and companies supplying cities and towns. The cloud is only wisp-like at present; but it will grow. The question is not finally abandoned; it is reserved for future consideration. A more serious thing is across the Border; and what is gaining shape there, is looked upon by aldermen and councillors down South with some alarm. Glasgow, Dundee, and other places are threatened by a Company who have made, or are making, arrangements for wayleaves with the North British and the Caledonian Railway Companies for carrying cables for the supply of premises abutting on to the systems. The Company have no statutory powers; their idea is to be a law unto themselves—by generating at the pithead, and carrying their lines over private lands, and along the railways, and so gain entry into important works and factories. The business is described by municipal undertakers as illegitimate; the promoters of the scheme, as brigands. But it is of the characteristics of brigands to be cool, and to care little what men think of them; and these particular brigands are showing this particular characteristic (according to good Aldermen and others who do not in their private business mind doing a good stroke themselves) of their utterly abandoned prototypes. However, there are grave doubts as to whether railway companies have the right to allow the transmission of electricity along their routes, and also as to the rights of private companies, without parliamentary authority, to invade any part of areas already supplied under parliamentary sanction. It is a moot point. Why not get someone to put a question regarding it to the President of the Board of Trade. He is a life debtor of Dundee.

The ratings that the manufacturers put upon the new metallic filament lamps are causing a little dissatisfaction, because they are really deceptive—description not tallying with result. A lamp is called (say) a 50-candle power one, and it requires 1·25 watts of electricity per candle power per hour, or a total of 62·5 watts per hour. But the so-called 50-candle power lamp should be described as a 50 Hefner unit lamp after the light standard of the Fatherland; and therefore equal to about 45 candles, with a total consumption of 62·5 watts per hour. It is inexplicable why these lamps cannot be marked in British candles. The explanation given by Mr. H. Hirst, in his recent paper before the Institution of Electrical Engineers, is not sufficiently weighty—that "it is found next to impossible to try to standardize metallic filament lamps per candle power. It would make the lamp commercially impracticable." The reason is a lame one; and its deformity would be exposed to a still greater extent if a few electricity undertakings would only insist on honest ratings, and have the valuation of the lamps expressed in British standard candles. The deceptive description of these lamps is not a matter that is new to readers of the "Memoranda."

Nor is another matter that is referred to in "Installation Topics" in the "Electrical Times." It was becoming common knowledge, before the advent of the new metallic filament lamps, that a single incandescent electric lamp of low candle power and so comparatively low consumption, could be used under most circumstances without the electricity meter taking note of the fact. Now the knowledge is flying that the reduction of the consumption of electricity brought about by the metallic filament lamps enables a single lamp of still higher candle power to be used without the consumption being registered. Of course, it is wrong to deliberately make use of this knowledge; but take some of those little houses that we hear about in West Ham and elsewhere that only incur an expenditure of a few pence per week on electricity, to supply which a capital expenditure of several pounds has been involved, we can well understand the occupiers of such houses saying that one 30-candle power lamp at a time is quite sufficient for their needs, and that it is not their fault if the meter takes no account of the electricity consumption of that lamp. Certainly it is not for the consumer, if he only wants a small light of the kind, to run two lamps, using double the quantity of electricity, for the express purpose of moving the meter registering mechanism. Of course, from this point of view, gas people have to concede, so long as electricity meters will not do their duty, that for a single low-power light gas cannot compete with the electric light in the matter of cost; and that is the only way in which electricity is the victor. But let the "Electrical Times" speak for itself. It is, says our contemporary, "becoming recognized that with the introduction of the new high efficiency lamps, a need has arisen (at least from the supply authorities' point of view) for meters which will be much more sensitive to small starting loads. It is no uncommon thing on a 200-volt circuit for a 30-candle power tungsten lamp taking 35 watts (equal to an 8-candle power carbon lamp) to have no effect upon the meter; also on low voltage supplies, where metal lamps of 16-candle power or less can be used singly, it would be difficult to find a meter which, under ordinary conditions, would quite respond to the load imposed by one such lamp. It is probable that no record would be made of (say) a 6-candle power metal lamp taking 7 watts or so, unless assisted by the transformer losses. This aspect of the metal lamp question has been somewhat overlooked; and it is possible that some portion of those losses now recorded in the station accounts as 'current unaccounted for' results from the failure of meters to register current taken by metal lamps of low candle power." This shows where electric lighting is cheaper than our boasted cheap illumination by incandescent gas-lamps.

Gaslight and Coke Company's Dividend.

We are informed by the Secretary of the Gaslight and Coke Company (Mr. H. Rayner) that the accounts for the past half year show that—subject to audit—the balance to the credit of the net revenue account will enable the Directors to recommend the payment of a dividend at the rate of £4 10s. 8d. per cent. per annum, carrying forward a balance of £412,298 6s. 1d. This result compares with a dividend at the rate of £4 8s. per cent. per annum for the June half of last year, with a balance of £306,992 carried forward.

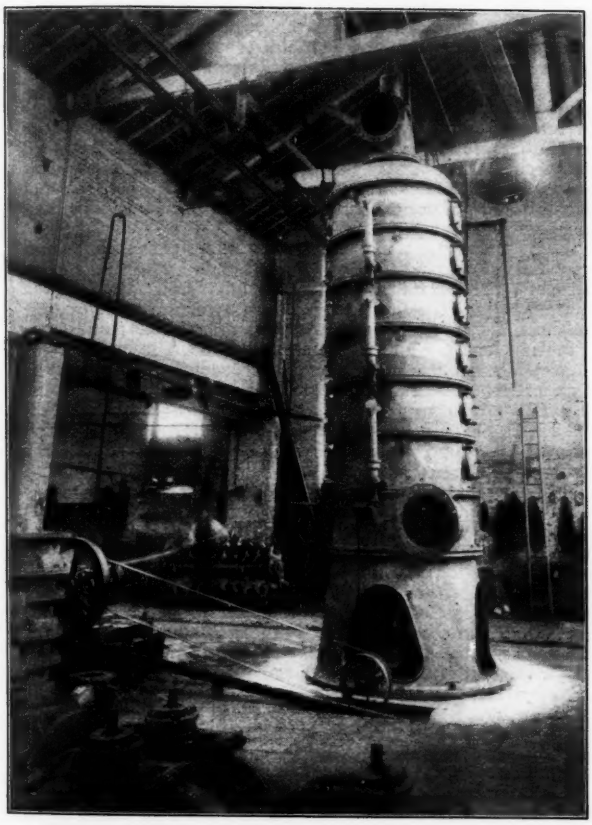
THE FIRST FELD WASHER BUILT IN ENGLAND.

Preliminary Notice.

YESTERDAY, on the invitation of Messrs. R. & J. Dempster, Ltd., a number of gas engineers and other interested gentlemen were allowed the privilege of inspecting the first of the cleverly-designed gas-washers of Herr Walther Feld, of Hönningen-on-the-Rhine, that has been built in this country, as well as the constituent parts of one of the washers now in course of construction.

A special account of the inspection, and the information and impressions of the new washer, will be published next week. Meantime, it may be mentioned that about forty engineers were present, including the President (Mr. Thomas Glover) and the Senior Vice-President (Mr. James W. Helps) of the Institution of Gas Engineers.

In the photograph, the completed washer as standing at the works of Messrs. R. & J. Dempster is the central feature; and some of the parts of the second washer are lying adjacent. The drawing shows a section of the apparatus. In his recent annual report as Chief Inspector under the Alkali Works Regulation Act, Mr. R. Forbes Carpenter gave as compendious a description of the washer as we have yet seen; and we reproduce it here: "The washer consists of a number of superimposed sections; each

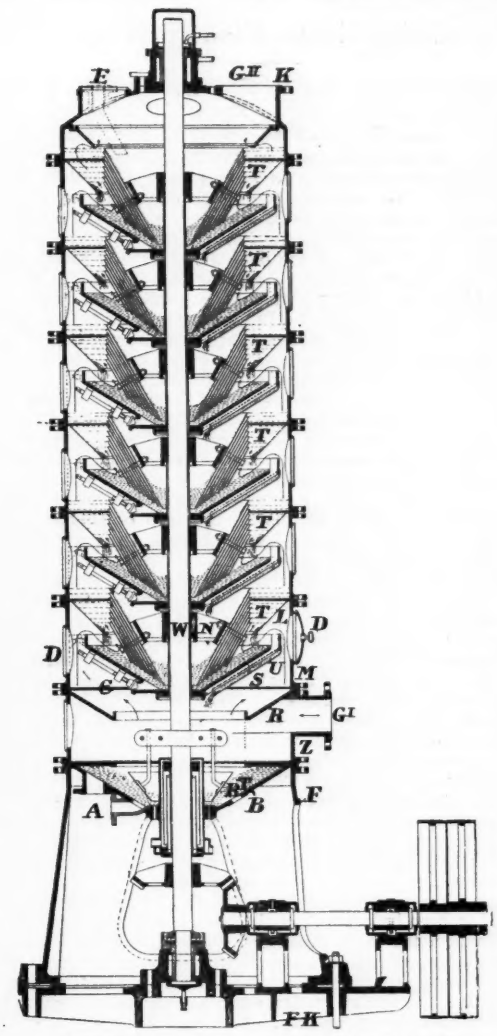


section consisting essentially of a stationary basin of less diameter than that of the external casing. In the centre of the latter is a vertical shaft to which revolution is imparted by gearing at the base of the washer. To this rotating shaft is keyed an arrangement of concentric funnels, which dip into the liquid in the stationary basins. Rotation causes the washing liquid to rise in the funnels and to be thrown as a fine spray towards the outer casing, at which point baffle-sheets direct the ascending gas inwards, where it is intimately mixed with the washing liquor in a very finely-divided state. The descending liquid overflows from basin to basin. The power to drive the apparatus, even with hot tar as the extracting liquid, is but small."

Herr Kobbert, in his paper before the German Gas Association in 1907, referring to the Feld washer, mentioned that it was fed with liquid from a pipe at the top, which revolves (according to the size of the apparatus) at the speed of 120 to 180 revolutions per minute; so that the centrifugal force propels the reagent against the sides of the vessel, and causes a uniform distribution of fine drops through which the gas passes from below.

If the sectional drawing is consulted, it will be seen that the baffle-plates cause the gas to take a zig-zag course through the washer, the purification efficiency of which is stated to be very high. Very little space is occupied by the vertical washer; and for a given capacity the size is smaller than for the ordinary horizontal types.

It will be remembered that in his Presidential Address at the meeting of the Institution of Gas Engineers, Mr. W. Doig Gibb



[See "JOURNAL," Dec. 17, 1907, for description.]

included some interesting particulars as to the performances of the washer; and, while he was not in a position to confirm all the claims of the inventor for his complete bye-product recovery process, he said he could certainly vouch for the extreme ingenuity embodied in the washer. "This machine," he added, "will probably be of considerable service in ordinary gas purification, and for the recovery of many bye-products; and its use will help towards the ideal condition of continuous purification *in situ*."

The patent specifications of Herr Feld have been noticed from time to time during the past year or two in our "Register of Patents;" and readers may now be interested in reviving their acquaintance with them. We shall, as promised above, return to the subject in a more definite and detailed manner next week.

The death, on the 13th ult., is reported of Herr K. Sand, at Augsburg, in his eightieth year. Deceased started his professional career as a constructing railway engineer, but later was for several years Manager of the Salzburg Gas-Works. In 1876 he took charge of the gas-works branch of a firm of constructing engineers at Augsburg, and in that connection built and reconstructed many gas-works. In 1882 he founded the United Gas-Works Company, which had attained considerable importance before he was compelled in 1900, by failing eyesight, to retire from his professional pursuits.

A defect of municipal ownership as commonly practised is criticized in a recent message from the Mayor of New York (Mr. M'Clellan) to the Board of Aldermen of the city. The water-works earned last year nearly $11,000,000. This sum, under the law, was put into the City Treasury; none of it being available for extensions and improvements of the works. These, however, are greatly needed; and the Mayor has been obliged to send an emergency message asking for an appropriation of nearly $3,000,000, on the ground that the actual safety of the works of the whole of Brooklyn and of the parts of Manhattan and the Bronx which are more than 60 feet above tide water, are threatened by failure to provide funds for repairs to the pumping-stations. These defective conditions have been known for a long time, and could have been remedied before this if the earnings of the water-works could have been used for the necessary maintenance and repair work. "In this respect," says "Engineering Record," "municipal control is far behind private control; for any great private corporation clearing $11,000,000 a year would long ago have used part of the money to keep its plant in good condition."

NOTES FROM WESTMINSTER.

THERE have been a few matters affecting gas undertakings under consideration in the Committee Rooms during the past week; but they have more of local than general interest about them.

In the first place, the London Gas Companies put in an appearance before the Committee considering the Port of London Bill; but the result was unsatisfactory. The London Gas Companies have, of course, large interests at stake in this scheme. Revenue has to be raised by the Port Authority for considerable new works and to carry on the obligations that the Bill proposes to entrust to them; and there is a great deal of uncertainty as to what the future will bring forth for those interested as users in the port. At the time that the Bill was introduced by Mr. Lloyd-George, when President of the Board of Trade, it was pointed out in our editorial columns that there were certain main questions upon which the Gas Companies should obtain a hearing—viz., the question of representation on the first Port Authority, and that of the dues yet to be fixed that it is proposed to inflict. The Board of Trade contemplate nominating for the first authority the representatives of the payers of dues on ships, the wharfingers, the owners of craft, and the payers of dues on goods, on the ground that a register could not be prepared in time for the first election. There is grave objection to this, inasmuch as those concerned should have representatives of their choice right away from the start, as experience must be accumulated from the very beginning that will be of value hereafter. The Committee did express an opinion that it would not be impossible to compile the necessary register of those having a title to vote; but they refused an amendment to the Bill to that effect proposed by the County Council, and supported by the Gas Companies. On the question of rates, the Committee treated the Companies rather brusquely. They simply declined to hear the Companies, through Sir George Livesey and Mr. Corbet Woodall, and referred them to the Port Authority and the Board of Trade when the schedule of rates was under consideration. The Companies wanted something more than this, as the duties of the Port Authority will not confer any particular advantage upon them; but any additions to the cost of coal will be of considerable importance to the gas consumers. The Committee were obdurate; and so there, in a most unsatisfactory position, the matter rests.

Among other questions of the week, the Potteries Federation scheme has been before a Committee, on the consideration of the Bill to confirm the Provisional Order embodying the federation scheme issued by the Local Government Board. The gas undertakings of the towns concerned are involved; but return can be made to this particular matter when the discussion before the Committee has been completed.

The Bill of the Central Ireland Electric Power Company (which, after being rejected by a Committee of the Lower House, had an unprecedented reintroduction in modified form, and was passed) came before a Committee of the Lords on Tuesday. The Alliance and Dublin Consumers' Gas Company were again in opposition. Our chief interest in the scheme is found in the fact that it is proposed to produce gas from peat for use in generating electric energy; and that the bye-products of the gasification of the peat are to be recovered. The Gas Company's opposition was on the ground that the heavy capital expenditure they have incurred in carrying out their statutory obligations to supply sparsely populated districts would be jeopardized by the Company. Revelation was made, too, that the financial aspects of the scheme were exceedingly dubious in character; and that there might be disaster for those of the public who, on the strength of parliamentary sanction, invested money in the concern. The position was not changed by the decision of the Committee; so that it would be waste of time and space to again discuss the scheme. The Gas Company merely obtained protection for their distribution system. Time will show whether or not Parliament was justified in allowing the scheme to go through, and whether or not the roseate views of the promoters as laid before the Committees of the two Houses had any foundation.

To the water section of the Keighley Corporation Bill, opposition was offered during the week, before the Police and Sanitary Committee, by the Haworth District Council, although it was thought this section had been finally disposed of in the Lords. The Committee evidently got a bit sick of Haworth; and after listening to much that was laid before them, they gave the opposition its quietus by declaring the preamble of the Bill proved.

Irish Association of Gas Managers.—The annual meeting of the Association will be held in the Town Hall, Holywood, on the 11th prox., under the presidency of Mr. T. Frizelle, the Engineer of the Holywood Gas Company. In addition to the usual routine business and the Inaugural Address of the President, Mr. J. F. Tyndall, of Wicklow, will read a paper on "Methods of Charging for Gas," and Mr. J. Brodie, of Lisburn, one on "The Fittings Department." Dr. Harold G. Colman will deliver a lecture on "The Effect on Practical Working of the Seals and Pressure in the Hydraulic Main and Retort." The Directors of the Gas Company have invited the members and their lady friends to luncheon in the Town Hall. The next day, arrangements have been made for an excursion to Portrush and the Giant's Causeway, and luncheon and tea will be served at the Causeway Hotel.

INSTRUCTIONAL AND EXPERIMENTAL GAS-WORKS AT CARLSRUHE.

Report of the Committee of the German Gas and Water Association.

IN continuation of the reports of the Technical Committees of the German Association of Gas and Water Engineers which were noticed in last Tuesday's "JOURNAL" (p. 96), we give to-day that of the Committee for the Instructional and Experimental Gas-Works at Carlsruhe.

These works, which have been erected on the land of the Corporation Gas-Works at Carlsruhe, were brought into operation on June 10, 1907, and were visited by some 150 members of the Association on the occasion of the annual general meeting last year, at Mannheim, shortly afterwards. Though the original scheme of construction and equipment had then been carried out, other requirements developed in the course of the next few months; and it was not until the end of last year that the works were finished. The expenditure up to that date, including preparing the site, building, apparatus, and furniture, amounted to 108,384 marks (£5400). The Association had set aside 70,000 marks for the works; and up to the end of 1907 contributions had been received from gas-works and others interested in the scheme amounting to 73,660 marks. In the meantime, working expenses amounting to 13,162 marks had been incurred up to the end of last year: so that, disregarding the 70,000 marks voted by the Association, there remained 47,886 marks still required to meet the total cost of the works. Up to the end of the year, 28,904 marks were drawn from the Association's funds; and arrangements were made for the balance of 18,982 marks owing to firms for retort plant and apparatus to stand over until the money market became more favourable. The extension of the original plan included the establishment on the ground floor of rooms for gas analysis and calorimetry. A more complete equipment of chemical and physical apparatus than had been originally contemplated was also provided.

The first and most important work undertaken had been a systematic examination of the coals suitable for gas making in Germany. This examination comprised distillation tests and the determination of the character and quality of the gas, coke, tar, ammonia, &c., produced under different conditions; and some of the results have already been published. The coals of the Rhenish-Westphalian coalfield take precedence, both in respect of quantity used and the number of gas-works employing them. Then follow in order the Silesian, Saar, and Saxony coalfields. The systematic trials of the coals have so far followed this order; but owing to the great distance of the Silesian coal-pits, and the consequent high freight, very little has so far been done with them. As it seemed to the interests of the owners of the pits to have their coal tested as it would be delivered to gas-works, they were approached with a view to their providing free samples for examination. The response has generally been favourable; and 10-ton samples of nine coals from different pits have been provided by the Rhenish-Westphalian Coal Syndicate. These were delivered carriage free at the experimental works. Eight similar samples were provided by the Prussian Mines Association at Saarbrücken; but on these samples the Experimental Works had to bear the cost of carriage. The same Association also placed at disposal samples from certain Rhenish-Westphalian and Silesian mines; but up to the present, owing to the high freight, advantage has not been taken of this offer. A large number of samples have also been sent carriage paid from the Saxony coalfields; and these are now under examination. Further, two English coals and lignites from the Saar district are being tested. More or less exhaustive carbonizing tests have been made up to the present time on 28 different descriptions of coal; and after completion the results will be collected and published.

In addition to this systematic examination of German gas coals, many questions were referred to the works dealing with almost all aspects of the manufacture and use of gas. Some of these questions could be dealt with forthwith; but others required a more or less serious investigation. Chemical and calorimetric tests were made of samples of coal, coke, and tar. Samples of gas were analyzed; and oils for naphthalene extraction and samples of liquor and of scrubber and gasholder water were also tested. Very many incandescent mantles, burners, and lamps (especially of the inverted type), were sent for examination by the inventors, manufacturers, and users. A number of instruments for checking the composition of gas and its calorific power, and pyrometers intended for use in gas-works, were sent for examination, and were exhaustively tested. Fees commensurate with the time expended on the test were charged for these investigations when they were made in the interest of private firms. It is specially gratifying to know that the works have been entrusted with the conduct of working trials, such as the efficiency trials of the vertical retort installations at Mariendorf (Berlin) and Zürich. For the carrying out of these trials, the staff of the Experimental Works was supplemented by trained assistants from the Carlsruhe Technical-Chemical Institute. Results of the trials have already been referred to ("JOURNAL," Vol. CII., pp. 813, 846).

The question has been raised in many quarters whether the Experimental Works cannot undertake special or regular investigations for small gas-works which do not have trained chemical assistants; but in the early stages it has been impossible to do

this. Likewise the question of collaboration with the various experimental works existing on the larger gas-works of Germany has been deferred. The experimental works have, however, kept in touch with the Technical-Chemical Institute at Carlsruhe, for the purpose of training in a scientific and practical manner young engineers who are taking up gas manufacture. In fact, the laboratory of the works was made available for their use before the works were completed. This year a complete course of instruction has been put at their disposal; and 38 students have taken advantage of it. Owing to the inconvenience caused by interruption of the course of studies both in the works and at the technical college, it was found necessary to receive only students who could undertake to devote at least three months entirely to the works course. Nine fully trained engineers have participated as assistants in the laboratory work in the course of last year; and it is hoped in this manner the works will, in course of time, form a valuable recruiting ground for the gas industry.

It is eminently desirable that the officials entrusted with the charge of such an institution should retain their positions for a reasonably long period. At the outset, naturally, a difficulty has been encountered in this respect; and Dr. A. Schmidt, the Engineer who had charge of the construction and equipment of the works and their early operations, resigned his position at the beginning of August, 1907, in order to take up a more attractive technical appointment. Dr. Henseling has succeeded him as Engineer-in-Charge. He has been assisted later by four other Engineers; and since January last, Dr. K. Bunte has joined in the technical work. The Committee desire to express their thanks to these and others who have participated in the work of the Instructional and Experimental Gas-Works, which, notwithstanding the difficulties naturally encountered in the first year, appear likely to fulfil expectations, and to enter on a really healthy and vigorous development.

The report (of which the foregoing is a full abstract) is signed by Herr Reichard and Professor H. Bunte.

Report of the Technical Training Committee.

The Committee report that, in the past year, the Technical Training School for gas-fitters at Munich has been completed, and its organization and the course of training followed there are dealt with in an appendix to the report. The Training School at Dessau completed its tenth year at the close of 1906, and a table is given in the report showing the number of men trained there and their destination on the completion of the course. The table also shows the expense incurred by the German Continental Gas Company in maintaining this institution for ten years. It has now been reorganized with a view to meeting the altered conditions of gas manufacture in the Association's works. A four weeks' course of training in the working of vertical retort-settings is now provided.

Those students who are admitted to the course must be between 24 and 30 years of age, and must, for at least two years, have been practically engaged on gas-works in the erection of settings. They must be recommended by the manager of their works, and preference is given to married men. Those admitted are provided with travelling expenses to and from Dessau, and are paid 4s. 6d. per day during the period of their training; while the families of married men are allowed to draw the usual wages from the works where the man was employed. The first three weeks of the course are devoted to practical work with the vertical retorts and experience in their construction and repair. The fourth week, it is arranged, is spent in the study of more theoretical matters, such as the examination of the products of combustion, the control of valves, &c., under the instruction of one of the laboratory officials.

The Training School for gas-fitters in Bremen is the subject of a second appendix to the report. The suggestion of Herr Hasse, that similar courses of instruction should be provided for waterworks foremen, has not yet been taken up. The Technical College at Carlsruhe and the Association's experimental works there have continued to undertake the training of gas engineers. At the Technical College a course of study extending over eight terms has been arranged. It provides a thorough grounding in chemistry as applied to means of illumination, and a good training in mathematics, mechanics, and electro-technology. It is intended, wherever possible, that the course of studies should be completed by reading for the degree of Doctor of Engineering. A shorter course of instruction is also provided for mechanical engineers who desire to follow up their special training by the study of chemistry as applied to the means of illumination. This course of study extends from the beginning of October to the end of July; and in the time instruction is given in chemical technology, technical methods of analysis, and the technology of gas manufacture. Practical work in the laboratory of the Chemical-Technical Institute and on the experimental gas-works occupies the rest of the students' time. The instructional aspect of the experimental works of the Association extends, however, to the provision of further opportunities for the pursuit of scientific technical work on the works; and so there is afforded ample opportunity for an exhaustive study of the theoretical, practical, and scientific sides of gas manufacture.

The report was presented at the meeting by Herr W. von Oechelhaeuser, the Managing-Director of the German Continental Gas Company.

A FRENCH VIEW OF VERTICAL RETORTS.

Our readers are aware that one of the subjects put down for discussion at the recent meeting of the Société Technique du Gaz was that of vertical retorts. Among the speakers was M. Sainte-Claire Deville, who made some remarks, of which the following is an epitome.

A rather thick mass of coal undergoing distillation, whether in vertical or horizontal retorts or in chamber furnaces, is composed of three parts: (1) A central core of uncarbonized coal, which the heat has not reached; (2) an outer crust of coke; and (3) an intermediate zone in active distillation from which issues the gas. The question that arises is this: Does the gas escape from the intermediate zone and traverse the fissures of the outer crust of coke, or does it pass into the interior and make itself a passage between the fragments of coal which are still comparatively cool? It is scarcely admissible that the resistances opposed to the passage of the gas by the coke and the coal should be strictly equal; and it is very probable that, one of these resistances being very much greater than the other, almost the whole of the gas issues either by the first or the second of the two ways indicated above. In Germany, the leading advocates of vertical retorts and chamber furnaces declare that the gas returns and passes through the coal; but M. Deville does not believe that all the German gas engineers who use vertical retorts agree with them. Notwithstanding his great admiration for the excellent work done by Dr. Bueb and Mr. Körting, M. Deville cannot bring himself to share their opinion in this respect; and he set forth, in a few words, the reasons which led him to come to the conclusion that the gas goes through the coke, and escapes along the walls of the retort.

In the first place, there is the question of pressures. It is well known that the pressure of the gas in the lower portions of a vertical retort charged with unscreened coal, though very high at first, decreases proportionately as carbonization progresses—in other words, the section of the coal passage decreases while that of the coke passage increases. The conclusion to be drawn is that the gas passes more easily through the cracked and fissured pieces of coke than through the thick mass of coal. Secondly, if the gas, in liberating itself, does not come in contact with the sides of the retort, how can the presence of graphite there be explained? When, at the end of the period of distillation, steam is introduced into the retort, it is relied upon to a certain extent to produce water gas with this graphite, and reduce its quantity. So that the steam makes its way by preference along the walls of the retort. Besides, when the coke is examined after drawing, the surface in contact with the retort appears mammillated and fissured—identically the same as in the case of the coke which comes in contact with the floor of a horizontal retort.

The principal argument in favour of the central passage is the absence of naphthalene in the gas and the tar, and particularly the small proportion of lamp-black in the latter. M. Deville said he appreciated the value of this argument. At the same time he remarked, with regard to naphthalene, that its absence from the gas could be explained as he had shown when speaking on the subject of condensation (see *ante*, p. 95). With reference to its absence from the tar, it seemed to him that this requires to be confirmed much more decisively than has been done up to now. As to the considerable reduction in the quantity of lamp-black in the tar, he thought the testimony which had been furnished on this matter did not leave room for doubt. He acknowledged this the more willingly because the same phenomenon is observed, though in a rather less degree, when coal is carbonized in thick layers, and *à fortiori* in fully-charged horizontal retorts. Before the results furnished in this connection by vertical retorts were made known, it had, he said, been noticed in Paris, and especially at the experimental gas-works at La Villette, that, with ordinary retorts, the heavier the charge of coal the more fluid and poor in fixed carbon was the tar. M. Deville explained this in the following way: In the case of a thick layer of coal, a notable proportion of the gas has still to be produced when there has already been formed round the central mass a crust of coke which has attained a red heat. It is in forcing themselves through the fissures of the coke that the volatile products are subject to the decomposing action of the high temperature; and the carbon resulting from this decomposition is immediately deposited in the pores of the coke, which is thereby rendered more dense than usual, and has imparted to it the appearance of metallurgical coke. The gas is, in a sense, filtered.

To sum up, M. Deville said he believed that the illuminating and calorific power of the gas and the yield of tar necessarily diminish in proportion as the thickness of the layer of coal undergoing carbonization increases, whatever may be the shape and inclination of the receptacle in which the operation is going on; and that, on the other hand, the quality of the tar improves. The extent of empty space with hot walls which the gas has to traverse before it leaves the retort also plays a part, but it is a secondary one; and the record of the amount of light produced per 100 kilos. of coal continues to belong to the 3-metre (10-feet) horizontal retort, carbonizing in four hours a thin layer of coal weighing at most 330 lbs. But during the past fifteen years the importance attached to illuminating power has gradually decreased, while the necessity for reducing and simplifying manual labour has become more and more pressing. If the relative interest that is

presented by these two points of view had fifteen years ago been what it is to-day, M. Coze would most certainly have given to gas managers a very inclined retort working with a full charge of coal, or possibly the vertical retort itself, or even the Munich carbonizing chamber. At that time, however, these solutions were not ripe.

In conclusion, M. Deville said he would make one remark specially applicable to the vertical retort. The absolute necessity had been recognized of charging into it, from two separate hoppers, small coal on one side and nuts on the other. There might possibly result from this practice two difficulties, the importance of which he did not wish to exaggerate, but which should nevertheless be pointed out. In the first place, the diaphragm separating the two classes of coal must be difficult to regulate so that one kind should never be in excess. It seemed, at first sight, that nuts would frequently be wanting. Secondly, in the greater part of the coals—of course, there were exceptions—the large pieces were much purer than the small coal. The result was that the mass of coke was very often composed of two parallel vertical columns, the quantity of ash in which would vary considerably. There was consequently an absence of homogeneity in the coke.

CANADIAN GAS ASSOCIATION.

First Annual Meeting.

In the "JOURNAL" for the 24th of December last, the formation of the Canadian Gas Association was announced. We learn from the last number of the "American Gaslight Journal" to hand, that the first annual meeting was held in the King Edward Hotel, Toronto, on the 26th ult., under the presidency of Mr. H. H. Powell, of Brantford, who was supported by the Vice-Presidents (Messrs. J. S. Norris and J. Keillor) and the members of the Executive Committee. There was an attendance of sixty—more than twice the number expected.

The first business was the reading of the minutes of the organization meeting and the respective reports of the Committee and of the Secretary and Treasurer, Mr. A. W. Moore, who, owing to illness, was unable to be present. These having been disposed of, the Committee on Nominations presented their recommendations for office-bearers for the ensuing year; and the following were duly elected:—

Honorary President.—Mr. H. H. Powell, of Brantford.
President.—Mr. J. C. Hay, of Listowel.
First Vice-President.—Mr. J. S. Norris, of Montreal.
Second Vice-President.—Mr. W. H. Pearson, jun., of Toronto.
Treasurer and Secretary.—Mr. A. W. Moore, of Woodstock.
Executive Committee.—Messrs. E. J. Philip, C. Forbes, J. Keillor, C. P. King, and P. S. Coates.

The President then proceeded to deliver his Inaugural Address, in the course of which he dealt with several matters that are now occupying the attention of gas managers both in the Dominion and in the United States. An interesting paper on "Coal Tar and Ammonia" was read by Mr. J. Keillor, of Hamilton. It led to a brisk discussion, which ended in a resolution recommending the executive officers of the Association to continue their efforts to prevail upon the Dominion Government to remove the duty on coal coming into Canada for gas-making purposes, and to put a duty on residual products. This brought the morning sitting to a close. In the mid-day interval, the members paid a visit to Hiawatha Island, to enjoy the hospitality of the second Vice-President, in the Royal Canadian Yacht Club.

On the resumption of the proceedings in the afternoon, the first paper read was by Mr. W. H. Pearson, jun. (whose father was, unfortunately unable to be present), on "Producer-Gas Fired Benches;" and it led to a good discussion. Mr. J. C. Forbes followed with one on "Gas Appliances;" and he was succeeded by Mr. E. J. Philip, who discoursed on "Producer Gas for Power Purposes." While the author expressed an opinion in favour of producer-gas plants for driving engines of more than 50-H.P., he was not at all enthusiastic about their utility for smaller motors. This view was shared by many of the speakers. A paper on "Experiences with Canadian Coal" was read, in the absence of the author, by the Secretary *pro tem.* (Mr. F. Burnett); but it did not give rise to any discussion. The last item on the programme was a contribution by Mr. L. S. Bigelow, on "The Commercial Side of the Industry."

The evening was enjoyably spent at Scarboro' Beach. The visit was paid at the invitation of the Gas Consumers' Company and the Economical Gas Apparatus Construction Company, who were the hosts of the Association during the meeting. The next morning an inspection was made of the manufacturing station of the Company, where considerable interest was manifested in the plant (in the arrangement of which manual labour is to a large extent dispensed with), and subsequently of the new works, which are now approaching completion. They were designed by Mr. W. H. Pearson, sen., and his staff of engineers, and have been constructed, under the supervision of Mr. W. H. Pearson, jun., by Mr. G. A. Bronder. Thus ended a very successful and profitable meeting.

LAMPS FOR INDOOR INVERTED LIGHTING.

The "Vesta-Veritas" Series.

OF inverted lamps constructed on the Graetzin principle, there would appear to be no end—which is excellent testimony to the efficiency of this particular type. The latest innovation in this direction to be brought to our notice is made by Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road, E.C., who (in addition to the outdoor lamps referred to on p. 100 of last week's "JOURNAL") are just putting on the market indoor lamps in four different styles under the name of the "Vesta-Veritas." These lamps, though as already mentioned they are on the now well-known Graetzin principle, possess several points which may be briefly noticed, in order that due consideration may be given to them.

In the first place, one of the objects aimed at in construction has been strength; and an examination convinces one that in this success has been attained. The lamps are of British manufacture, and of excellent finish. The first illustration is of a lamp in brass; and it may be remarked that, while attention has been paid to neatness of design, nothing whatever has been sacrificed in the way of efficiency, which is the same as that of a "Graetzin" lamp. The form shown is made in two sizes; the larger giving 110 candles for a consumption of just under 4 cubic feet, and the small one a light of 70 candles with a consumption of about 2½ cubic feet of gas. Another style of the same lamp must not be forgotten, for it is attractive in appearance, easy to keep clean, and does not tarnish. In this form, the whole outer casing—the body and the globe-holder—is made in one solid piece of china. There is no visible brass part whatever exposed to the products of combustion. The lamp with the china body is, however, only made in the large size. The fourth type (which is also illustrated) is specially designed for offices, warehouses, factories, shops, and so on. As will be seen, it has a combined body and reflector, all in one piece; and it is supplied in green enamel, with gold lines.

Indoor Brass or China-Covered "Vesta-Veritas" Lamp.

With the exception of the differences in the bodies that have already been pointed out, the lamps are all constructed in precisely the same manner. The arrangements for adjusting both gas and air have had attention bestowed upon them. The screw by means of which the split-cone gas-injector nipple is adjusted has an ebonite fitting, which does not get so hot that it cannot be touched. In this way, the burner can, without inconvenience, be adjusted when alight. This split brass cone allows the gas to pass through the burner absolutely unimpeded; whereas it is pointed out that, when a pin is used, if the pin happened to be not quite in the centre, the gas would pass unevenly, and the mantle might not be equally heated all round. A little lever draws attention to the air-regulator, which it manipulates on the slightest pressure being applied to it; and this, of course, can be easily worked at any time. Then, again, the air-holes are surrounded by a kind of network or cage, in order to protect them from dirt, insects, and so on. The lamps are made so that the magnesia burner-nozzle which is arranged to take the "Vesta-Graetzin" mantle, may be unscrewed and replaced by another nozzle, which will permit the lamp to be used with all kinds of inverted mantles. Finally, it may be mentioned that all the patterns can be had either with or without bye-passes.

Enamelled Reflector "Vesta-Veritas" Indoor Lamp.

Mr. M. Illingworth, of Formby, Lancashire, has been appointed Manager of the Holsworthy Gas-Works.

ROUND THE WORLD—AND SOME GAS-WORKS.

By Maurice Graham.

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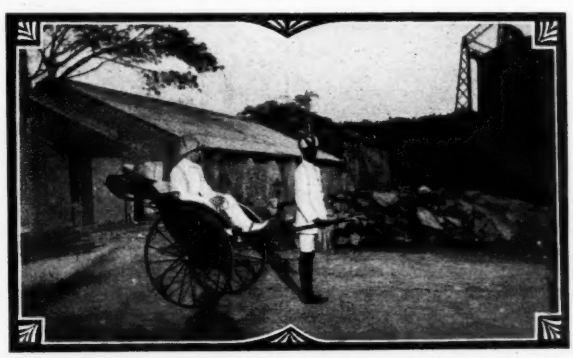
Photograph No. 42.—Strand Road—One of the Principal Thoroughfares in Rangoon.

V.—FROM BURMA TO CEYLON, VIA MADRAS.

From Calcutta the writer took the steamer to Rangoon, Burma, which was reached two or three days later. The population of Rangoon is 250,000; and its general appearance from the steamer is that of a long quay or street, called the Strand, on the river bank. The town contains few important buildings, beside administrative offices. It has no gas works, although lamp-posts are in some streets, as can be seen in one of the principal ones, Strand Road, shown in Photograph No. 42. There are electric light works, which provide a somewhat poor illumination; but the light is in all hotels, clubs, large houses, and public buildings. The writer was informed that the Municipality have given the Electric Light Company a ten years' contract; and that they are now making new arrangements to carry it out.

The traffic on the River Irawadi, which is navigable for at least 1200 miles, is really wonderful; and one particularly notices the predominance of the British flag. Although so far away from England, the writer was surprised to recognize Mr. William King (of Liverpool), who was taking a pleasure trip through Burma. The journey from Rangoon to Bhamo by steamer, *viâ* Prome and Mandalay, occupied about ten days. The last-named town is a disappointment to the tourist, as, since its capture by the British in 1885, it has been entirely rebuilt by the Military Authorities; and its Markets, Post Office, and all public buildings look like huge barracks, ready for emergencies. Though it has a population of about 200,000 people, it has no gas. Burma, indeed, is the land of peaceful people, beautiful climate, lovely scenery, but not of gas undertakings. The towns up the river and elsewhere are all lighted by oil-lamps. Returning to Rangoon, the Burma Oil Company's works, where the crude oils are distilled, were among those of interest visited.



Photograph No. 43.—The Engineer and Manager, Mr. H. Gage Edwards, Colombo Gas-Works.

After a four days' sea voyage, Madras was reached. This city, o half-a-million inhabitants, suffers from the loss of its sea-going trade by reason of the lack of security of its harbour. There is nothing in it approaching a busy, thriving city; but a few large buildings are now being erected, and the commencement of prosperity is hoped for. The journey was continued by rail, *viâ* Trichinopoli, Madura, and Tuticorin, whence a sea passage of twelve hours brings the traveller to the great port of the Island of Ceylon.

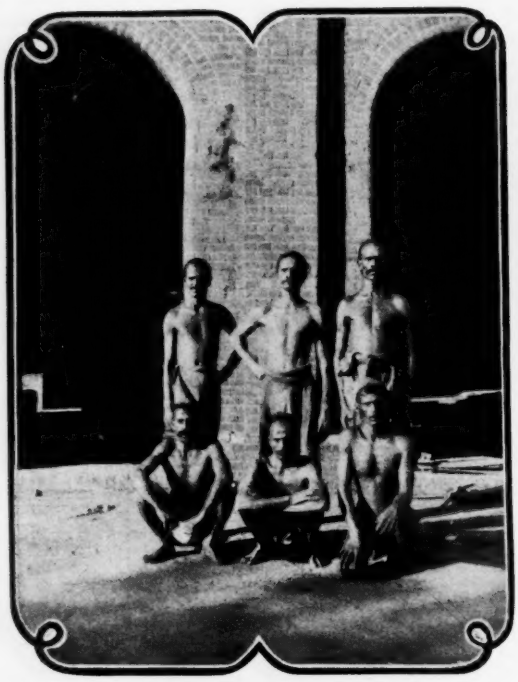
Colombo harbour is protected by a magnificent breakwater; and a million pounds sterling are now being expended, which will increase the protected water area by one-third and provide a graving dock of ample size. Everywhere was bustle and hurry; tea and rubber the great topics of conversation. The streets present a wonderfully varied cosmopolitan scene, with rickshaws, gharries, waggonettes, and bullock carts.

Colombo Gas-Works.

The Colombo Gas and Water Company, Limited, own the gas-works, which were established in 1872. They supply a populated area of about 160,000; while the number of their consumers is now over 1200. The Engineer and Manager is Mr. H. Gage Edwards, who was formerly Assistant-Engineer under Mr. A. F. Phillips at the St. Albans Gas-Works, so he was brought up in a good sound school of gas engineering. In Photograph No. 43 he is seen in his "one-man power" rickshaw. A new broom sweeps clean is an old saying, and true; but Mr. Edwards is studying economy and expense first of all, and contents himself with sweeping clean at a slow but sure speed. Since he held the reins, he has made many improvements and alterations, which are all to his credit, and show the visitor that his mind is in his work. In small works one has to be very careful of any extra expense on little things which in a large works would perhaps never be noticed at all.

A stroll round the works was begun at the retort-house. It is a substantial building, and at present contains ten beds of horizontal retorts, or in all 60 retorts, 9 feet long by 21 in. by 15 in. The beds are on the regenerative principle, and were working very nicely. A difficult piece of furnace work was noticed by the writer; one of the beds being under repair next to a setting that was in fire. This has been done many times in England; but in this climate of excessive heat, the task was even more difficult. However, no difficulty was anticipated; and the natives appeared to be determined to finish the work. The stokers are Tamils; and a snap-shot of a group of them is given in Photograph No. 44. They are paid at the rate of 10d. per day; and the cost of carbonizing per ton amounts to 1s. 6d. The hydraulic main and the take-off arrangements are on the Phillips pattern.

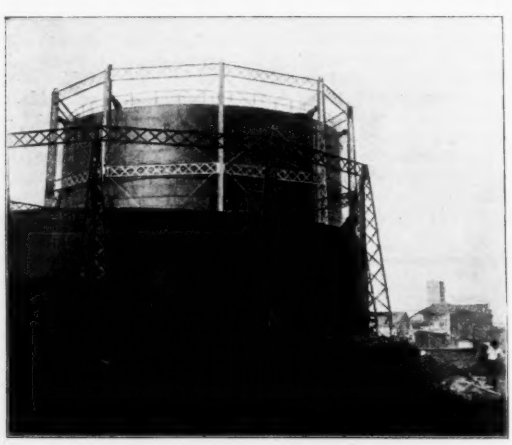
The coal generally used is Indian Sanctoria, which is received in bags loaded into double bullock carts. A consignment or two of Japanese coal had arrived, and was giving excellent results. "Japs" again! They are everywhere now; in fact, before long one will expect to find them about as much as the canny Scot. Owing to recent Indian Railway troubles, Mr. Edwards has been



Photograph No. 44.—A Group of Stokers.

through a very anxious time, as the cargoes of coal did not turn up at the expected time. There is a fair local market for the sale of coke (at about 23s. per ton), which is sorted and screened by the fair women pictured in Photograph No. 45.

The condensers consist of 20 annular pipes, and, like the washer and scrubber, are protected from the sun by galvanized roofing. The condensers are also water-cooled. The engine-house is fully equipped, and contains two exhausters—one by Donkin, of 15,000 cubic feet per hour, and the other by Waller, of 25,000 cubic feet. The two Cornish boilers are fired with breeze. The capacity



Photograph No. 46.—Two of the Gasholders.

of the Livesey washer is 500,000 cubic feet; the tower scrubber is 48 feet high by 5 feet diameter.

The purifiers are five in number; four being water-sealed and one dry-sealed. All are 12 feet square, and are filled with oxide. The usual lifting apparatus and dry centre-valve complete this plant. The Engineer has put in a bye-pass, so as to ensure perfect safety and relieve anxiety in case of any leakage or repair of the centre-valve. The station meter (of 12,000 cubic feet per hour capacity) is an old friend, but true. There are three gasholders, of a total capacity of 310,000 cubic feet. Two of them can be seen in Photograph No. 46. The photometer room and laboratory are both well fitted; and a square building, situated in the centre of the works and known as the "Clock Tower," contains the Manager's offices (Photograph No. 47). The general lay-out of the works is very good; but there is little room for extension when required. The annual make of gas is 70 million cubic feet; and the maximum production per twenty-four hours is 250,000 cubic feet.

Colombo Public Lighting.

The general gas lighting of the streets of Colombo is really magnificent, and does the Manager every credit. The good display is due to the 2230 incandescent gas-lamps in the town; and especially fine is the lighting of the Galle Face Promenade (see

Photograph No. 45.—Women Coke Screeners and Sorters.

Photograph No. 48), which is accomplished by 26 Welsbach self-intensifying lamps of 600-candle power each. Thus does gas more than hold its own in the face of very keen competition with the electric light, distributed by a private Company, who are ever alert to take every opportunity to push their illuminant. There are about 90 miles of gas-mains, 2 ft. 6 in. below the surface, and an active staff of lamplighters, who are grouped together in Photograph No. 49. The municipal lighting is done under a ten years' contract. For the Hospital, the Gas Company have installed a separate Keith's compressing plant. Gas-mantles used in private houses are being maintained at 4d. per burner per month; and the Company have done good business in supplying gas for power purposes for driving gas-engines for separate electrical installations for houses and hotels. Not much is done with gas-cookers and gas-fires, but a good deal with boiling-stoves and water-heaters.

The Company have a splendid fittings department, and supply and fix 90 per cent. of the work in Colombo; the remaining 10 per cent. is done by native plumbers, whose work has to be tested by the Gas Company's inspector before being connected up to the meter. New offices and show-rooms are anticipated shortly, to cope with the increasing business.

The residential quarters of the Gas Company's assistants are exceedingly nice, and are provided with the necessary tennis court—necessary, because, in the East, all Europeans must take active exercise to ensure perfect health. It seems strange, but throughout India and Burma every Englishman, whether civil or military, has a tennis court attached to his house; the reason being that such exercise, whether it is liked or not, is essential for health's sake in these climes.

Kandy.

The inland trip from Colombo to Kandy takes four hours. *En route*, the scenery is magnificent and the foliage luxuriant—

Photograph No. 47.—The Clock-Tower and Manager's Offices.

Photograph No. 48.—Promenade Lighted by Welsbach Self-Intensifying Lamps of 600-Candle Power.

cocoa, rice, and tea, presenting a picture as of one tremendous garden. Kandy may be described as a "Riviera" town on a huge lake; palms abounding in endless variety. The Colombo Gas and Water Company also own the electric light works at Kandy. They are under the management of a very competent Electrical Engineer, Mr. Baird. The general business of the Company at Kandy as well as at Colombo, is controlled by Mr. Edwards, acting under the Local Committee, of whom Mr. Wardrop, a very able gentleman, is Chairman.

To return to Colombo. The impression one gained of the town and surroundings was that the Gas Company have a very valuable business, which will increase by leaps and bounds directly the boom in building commences. And this, the writer was informed,

Photograph No. 49.—The Lamplighting Staff.

would not long be delayed. The town has a floating population of tourists; and it is also the business centre for tea and rubber planters. Consequently, the Gas Company have a good foundation to rest upon, and should enjoy a good return for their outlay. The present Engineer and Manager, Mr. H. Gage Edwards, who successfully manages the gas and electric undertaking, is held in high esteem by the residents of all classes in Colombo and Kandy.

Cleaning Gas-Stoves.

Report informs us that "Gascolite" has, as we expected it would do, found favour in several gas-works. Its purpose, it is almost unnecessary to say now, is for the removal of grease from gas-stoves, especially the burnt grease from the linings of cooking-stoves. Anything that enables this to be done expeditiously and well, when the "anything" is not expensive, must save time and money; and "Gascolite," we hear from disinterested sources, does meet requirement. It has hitherto been sold only in bulk by Clark's Lead and Colour Works Company, of Reading; but they have made a new departure, in addition to bulk dealings, which we think will appeal to gas managers and consumers alike. The reason that so many cooking-stoves are returned to the gas-works in a filthy condition is the labour involved in cleaning off the grease. But with "Gascolite" offering a simple means of producing cleanliness without hard labour, there should be a field for its sale in small tins at reasonable prices; and this should conduce to some lightening of the cost to gas suppliers of maintaining cooking-stoves in fit condition. Clark's Company are now supplying the cleansing substance in small tin boxes at prices enabling gas undertakings to push it among their customers, and to compensate for their trouble in the matter, without taking into account the better condition of the stoves.

THE TESTING OF GASES FOR SULPHURETTED HYDROGEN.

In the notice of the Forty-Fourth Annual Report of the Chief Inspector under the Alkali Act (Mr. R. Forbes Carpenter) which appeared last week, reference was made to the above subject. The following is the section of the report in which it is dealt with.

Much work has been directed by chemists to the detection and estimation of small traces of sulphuretted hydrogen in gaseous mixtures of a neutral character, more especially coal gas. Using the Gas Referees' apparatus, Dr. Rideal found that the delicacy of the official test was such that one part of sulphuretted hydrogen by volume in 5 millions could be detected on passing 5 cubic feet of coal gas per hour. At a later date, Messrs. W. J. Dibdin and R. G. Grimwood had occasion to re-examine the whole question, in connection with the proposal made in 1902 to modify the test for sulphuretted hydrogen as used for the London gas supply. The results of this research were embodied in a paper read before the Society of Public Analysts in that year.* The authors rejected the sodium nitro-prusside test as being insufficiently sensitive for the purpose in hand; and the presence of tarry matter in the gas precluded the use of an estimation of sulphuretted hydrogen by the colorimetric wet method, based on the use of standard lead solution. From the results of a preliminary series of tests on various papers soaked in solution of lead salts, the authors were led to adopt as a standard a paper prepared by moistening with a 12 per cent. solution of lead acetate; the paper being placed while still wet in ammonia fumes and subsequently dried.

An attempt to produce a standard set of colours corresponding to varying proportions of sulphuretted hydrogen proved a failure, owing to the evanescent nature of the colour-spot and to the difficulty of accurately matching the colours. More reliable results were obtained when the gas was passed at 0·5 cubic foot per hour on to standard lead paper held at a known distance from the nozzle. Under these conditions, it was found that the time required for discoloration was a constant for gas containing the same proportion of sulphuretted hydrogen. [The mean results were summarized in the paper.]

The procedure detailed by Messrs. Dibdin and Grimwood is inapplicable to samples drawn from the chimneys and flues of chemical works in all but exceptional cases. Not only is the sulphuretted hydrogen in general associated with condensable vapours and sulphur dioxide, but tarry matter, soot, and suspended solids are often present, which would at once coat the test-paper if the gases were allowed to impinge directly on the surface. The only practicable method of applying the test in such cases is to aspirate the gases from the flue or the chimney through a glass tube holding the test-paper, with or without the interposition of a filter of cotton wool or asbestos fibre to arrest the soot and other suspended matter. Under these conditions, the test-paper is exposed to contact with a large body of gas for a given time; the gaseous stream flowing quietly over the surface of the paper, and without the excessive friction that obtains in the Dibdin method. These conditions were imitated as closely as possible in laboratory experiments that are now to be described. [The arrangement of the apparatus is explained.]

Method of Preparing Gaseous Mixtures.

Sulphuretted Hydrogen and Air.—Strong mixtures (1 vol. H_2S in 10,000 vols. of air, &c.) were prepared by filling suitable gas pipettes (capacity 1·2 c.c. to 12 c.c.) with sulphuretted hydrogen of determined strength, and passing the gas into the globe of the apparatus. Weaker mixtures were made by withdrawing a proportion of the stronger mixture into a dry exhausted burette (120 c.c.) and returning it to the globe, after refilling the latter with pure air. In the earlier experiments, the gas was measured over cylinder oil; but the oil was found to dissolve traces of stronger gas, and give it up again in contact with weaker, thus contaminating the samples and vitiating the results.

Sulphur Dioxide Mixtures.—The calculated amount of dilute sulphur dioxide gas (20 c.c. to 100 c.c.) was measured off in a Bunte burette over mercury and driven into the globe. From 40 to 45 minutes were allowed for mixing, after admission of the gas or readjustment of the mixture.

Lead Acetate Paper.—The following samples of paper were prepared and tested: (1) "Dry" paper—Schleicher and Schüll filter-paper (No. 589, black band), soaked in a 12 per cent. solution of lead acetate, and dried at 80° to 90° C. (2) "Moist paper"—Filter paper of the same quality soaked in a 12 per cent. lead acetate solution containing 5 per cent. of glycerine, and partially dried (paper damp to feel). (3) "Moist NH_3" paper—Sample "moist" paper (2) held before use in fumes of strong ammonia. (4) "Dry paper wetted with NH_3"—Sample "dry" paper wetted before use on lower half of strip with concentrated solution of ammonia.

Procedure.—To test the effect of sulphur dioxide upon the test, a mixture of sulphuretted hydrogen and air was first prepared, and its action on lead paper determined. To the gas remaining in the globe (about 10 litres), the calculated amount of sulphur

* See "Journal," Vol. LXXX., p. 687.

dioxide was admitted. After some 40 to 45 minutes' interval for mixing, the tests were repeated, and the results compared. The sample papers were then matched with sepia, and sealed up in test-tubes for reference.

In each test, 1100 c.c. of gas were used; the time being five minutes, equal to 13,200 c.c. (nearly half-a-cubic foot) per hour. The moment a discoloration was first noticeable on the paper, it was recorded, as well as the final effect. The more important results, obtained are summarized as follows:—

Sulphur Dioxide Absent.

Test Paper.	Gaseous Mixture Contains 1 Volume of H_2S per	Effect on Paper.		Smell.
		Colour Stain Noticeable in	Colour Effect in Five Minutes, 1100 c.c. of Gas.	
	Volumes.	Secs.		
(1) "Dry." Gas impinges centrally	100,000	At once	Black . . .	Decided.
(2) Ditto. Strip suspended . . .	,,	30	Deep brown .	,,
(3) "Moist." Strip suspended . .	,,	30	Deep brown; rather lighter than No. 2.	,,
(4) "Dry." Suspended . . .	1,000,000	..	Faint brown .	Slight
(5) "Moist NH_3." Ditto.	,,	..	Slight brown; deeper than No. 4	,,
(6) Ditto. Impinges	,,	..	Deep brown .	,,
(7) "Dry." Impinges	10,000,000	..	Remains white.	None
(8) "Moist NH_3." Ditto . . .	,,	..	Slight stain .	,,

Sulphur Dioxide Present.

Test Paper.	Gaseous Mixture Contains		Effect on Paper.		Smell.
	H_2S One Volume per	SO_2 per Cubic Foot.	Colour Stain Noticeable in	Colour Stain in Five Minutes, 1100 c.c. of Gas.	
	Vols.	Grains.	Secs.		
(1) "Dry." Suspended	70,000	0 5	45	Light brown; much lighter than No. 2.	SO_2, acetic acid H_2S.
(2) Ditto. Ditto. .	,,	Nil	20	Decided brown	,,
(3) "Moist NH_3." Suspended	,,	0·5	45	Decided brown; lighter than No. 4.	,,
(4) Ditto. Ditto. .	,,	Nil	45	Decided brown	,,
(5) "Dry." Suspended . . .	90,000	1·0	..	Remains white	,,
(6) Ditto. Ditto. .	,,	Nil	30	Decided brown	,,
(7) "Moist NH_3." Suspended	,,	1·0	30	Grey brown; lighter than No. 9.	,,
(8) "Dry, wetted NH_3." Ditto	,,	1·0	30	Brown on wet; white on dry.	,,
(9) "Moist NH_3." Ditto . . .	,,	Nil	30	Brown . . .	,,
(10) "Dry." Suspended	90,000	1·5	..	Remains white	SO_2, and acetic acid predominate
(11) Ditto. Ditto. .	,,	Nil	30	Decided brown	,,
(12) "Moist NH_3." Suspended . .	,,	1·5	30	Light brown .	,,
(13) Ditto. Ditto. .	,,	Nil	30	Brown; much deeper than No. 12.	,,
(14) "Dry." Suspended . . .	80,000	2·5	..	Remains white	,,
(15) "Moist." Ditto	,,	2·5	..	Remains white	,,
(16) "Dry." Ditto .	,,	Nil	30	Decided brown	,,
(17) "Moist NH_3." Suspended	,,	2·5	..	Pale mottled brown	,,
(18) "Dry, wetted NH_3." Ditto	,,	2·5	..	Decided brown on wet; white on dry.	,,
(19) "Moist NH_3." Ditto	,,	Nil	25	Decided brown; much deeper than No. 17.	,,

From a consideration of all the facts, of which the examples recorded above are typical, the following conclusions are drawn with respect to the results obtained by the described procedure.

SULPHUR DIOXIDE ABSENT.

(1) *Condition of Test Paper.*—With gas up to 1 volume H_2S in 100,000 volumes, the condition of the test-paper does not greatly affect the amount of discoloration; "dry" paper, "moist" paper, and "moist NH_3" paper being about equally sensitive with suspended strip. With gas up to 1 volume H_2S in 1,000,000 volumes and upwards, "moist NH_3" paper is most sensitive, and should alone be used.

(2) *Direction of Current.*—The test is far more sensitive when the gas is made to impinge directly on to the surface of the paper. Thus, "moist NH_3" paper is only slightly discoloured by air containing 1 volume H_2S in 1,000,000 volumes when the flow is parallel to its surface; it is, however, deeply stained when the gas impinges.

(3) *Quantitative Significance of Results Obtained with Suspended Strip.*—Stains of equal depth are obtained under the same conditions as regards quality of test-paper, direction, and rate of flow of gaseous current and proportion of sulphuretted hydrogen present.

Other conditions being equal, if the strength of the gas be varied, the discoloration is greater as the proportion of sulphuretted hydrogen is increased; the differences of colour obtained with gas up to 1 volume H_2S in 10,000, 20,000, 50,000, 100,000, &c., being easy to distinguish. The limit of sensitiveness for "dry" paper is about 1 volume of H_2S in 1,000,000 volumes; for "moist NH_3" paper, 1 of H_2S in 10,000,000, with suspended strip.

SULPHUR DIOXIDE PRESENT.

Sulphur dioxide renders the lead-paper test less sensitive to sulphuretted hydrogen. The effect commences with a concentration, 0·5 grain of SO_2 per cubic foot (1 volume of SO_2 per 2500 volumes), and increases with the proportion of sulphur dioxide present. Thus, with 0·5 grain of SO_2 per cubic foot, the discoloration produced on dry paper by 1 volume of H_2S in 70,000 volumes is reduced from decided brown to light brown; with 1 grain per cubic foot, the "dry" paper remains white on 5 minutes' contact with air containing 1 volume of H_2S in 90,000. Ammonia applied to the paper, either as fumes or as solution, renders the paper more sensitive, but does not wholly neutralize the prejudicial effect of sulphur dioxide. In presence of this gas, therefore, the quantitative significance of the test is greatly diminished.

A MONSTER GAS-COOKER.

At a recent successful Ilford Hospital Carnival (in which over 300 decorated cars and waggons, cyclists, and pedestrians in fancy dress took part), "Gas" was represented by the Ilford Gas Company with the monster Richmond "Model" gas-cooker shown in the accompanying illustration. The top of the cooker was 12 feet high from the lorry, or 16 feet from the ground. The hot-plate measured over 7 feet wide and 7 feet deep. There were two doors, so that onlookers on either side of the road could see a front of the cooker. Inside the cooker were large papier-mâché representations of joints, which created no little amusement, being so realistic in appearance. For half-a-mile or more this huge gas-cooker, with its wording "Cook by Gas," could clearly be read, as it traversed the line of route.

Visit of Engineers to the Davis Gas-Stove Foundry.—Last Thursday, a party of members of the Junior Institution of Engineers accepted the invitation of the Davis Gas-Stove Company to visit their new works, the "Diamond" Foundry, at Luton. Many of the visitors were accompanied by lady friends, the attendance numbering about 40, all of whom spent a very pleasant and instructive afternoon. They were particularly impressed with the size of the moulding-shop, and by the two large cupolas situated at the farther end of it. The other sections of the foundry, including the testing-shops, fitting, grinding, and passing shops, and the extensive warehouses were inspected; and evidence was afforded that the Company are very busy. The "New Davis" cooker came in for a great deal of very interested comment on the part of the young engineers, who were particularly struck with the manner in which the stove is fitted. It was pointed out that there was a saving of from fifty to sixty screws in the construction of the cooker, yet without detriment to its rigidity and economy on the score of maintenance. In the presence of the visitors, one of these cookers was taken to pieces in rather less than two minutes. A very interesting afternoon was brought to a close with tea, provided at the Red Lion Hotel.

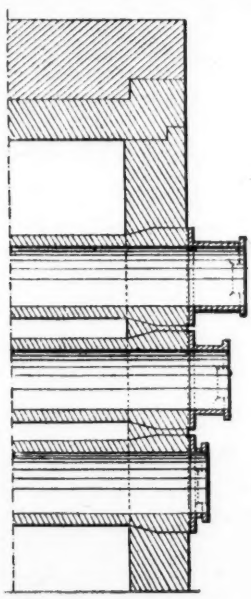
NEW ARRANGEMENT OF RETORT MOUTHPIECES.

By M. Marcou.

[Abstract of a Paper read before the Société Technique du Gaz.]

Generally, retort mouthpieces and lids are all in the same vertical plane. Such an arrangement is inconvenient when drawing the retorts. The hot coke falling from the retort being drawn on to the lids of the retorts below damages them; and tar falling on them, drop by drop, dirties them. Moreover, the fragile hot coke only reaches the conveyor or barrow after several knocks, unless it is deflected outwardly; and the dust produced reduces the yield of coke. Further, the flames given off when charging a retort attack the lids above, distort the fittings, and light any leaks which may occur at the joints. To obviate these inconveniences, sheet-iron guard plates may be used, or movable discharging shoots can be adopted; but the former get worn out, and the latter are rather complicated.

The arrangement adopted at the Versailles Gas-Works is shown in the illustration. It is a remedy which involves no complication



in the construction of the retort-beds, nor any new mechanism. The higher the retort, the more its mouthpiece projects. The projection may vary according to circumstances; at Versailles it is about 150 millimetres (6 inches). The coke will fall free of the mouthpiece below it, and the flames will only touch the bottom of the mouthpiece above, and not the lid or levers. The method is a simple and economical one, and has been definitely adopted at Versailles.

REFRACTORY COATING OF RETORT-BEDS.

By M. Maggioni.

[Abstract of a Paper read before the Société Technique du Gaz.]

M. Jules Arnold, the Manager of the Wienne-Gaudenzdorf Gas-Works, has recently tried coating or jacketting the outside walls of retort-benches with a material known as "Thermalite." It is composed of refractory and silicate materials, which are finely powdered and mixed with cork refuse. After considerable compression, the pieces—in the form of bricks, tiles, plates, or segments—are heated to 1000° C. in special furnaces. The result is a very porous, light, red brick, which has a specific weight of 0·30, a compression resistance of 17 kilogrammes per square centimetre (242 lbs. per square inch), and a tension of 7·22 kilogrammes per square centimetre (about 100 lbs. per square inch). It can be easily worked with a knife or saw.

The detailed results of the experiments at Gaudenzdorf are not yet to hand, but the practical results are stated to be: (*a*) Porcelain or ceramic bricks can be used for the façades of the bench, as in coke ovens. (*b*) There is a better fuel result by reason of the less loss of heat. (*c*) Reduction in the stoppages of ascension pipes. (*d*) The stokers' labour is greatly reduced. (*e*) The cleaning out of hydraulic mains and work on the top of the bench is much easier and lighter, for there is less heat under foot. (*f*) The hydraulic main, by not being exposed to the heat of the bench, begins to act partly as a condenser.

A table gives the results of a test made on a pipe of superheated steam at 234° C. (453° Fahr.), and 8 atmospheres pressure, the pipe having been covered with "Thermalite" tiles 5 centimetres (2 inches) thick.

The inside diameter of the pipe was 169 millimetres, and its outside diameter 178 millimetres (7 inches).

The length of pipe between the two thermometers was 18·800 metres, or nearly 62 feet.

The external surface of the naked pipe was 10·51 square metres, o 113 square feet.

The average quantity of steam passing per hour was 2135 kilogrammes.

The average temperature of superheated steam was 220° C. (428° Fahr.).

The average flow of the steam was 6·28 metres (20 ft. 7 in.).

The average external temperature was 15° C. (59° Fahr.).

The average fall of temperature along the 18·800 metres of length was 6°.

The average fall of temperature per metre run was 0·32°.

At the close of the paper, M. Godinet (the President-Elect) characterized the communication as one of very great practical importance. The quantity of heat lost in retort-settings was, he said, very considerable; and if managers had at their disposal better isolating bricks, they would be able to effect great economy of fuel. The Society had before them eight years ago a report by M. Euchène on the subject of the quantity of heat required for the carbonization of coal; and they were shown by him how much heat is lost by radiation from the brickwork of the settings, owing to the character of the bricks. The solution of the problem had been brought about in Germany in a different way from that proposed by M. Maggioni. In order to avoid loss of heat at the upper part of the settings, the Germans isolated their ovens with stock bricks from 2 to 2½ inches thick, which answered the purpose admirably. M. Maggioni had suggested the employment of cork. This, however, was not the only substance that could be used for isolating purposes; breeze or even sawdust being equally suitable. All the same, the communication was of interest, inasmuch as it showed how managers could realize economy of fuel in the working of their retort-settings. M. Maggioni, in reply, said the Stettiner Chamotte Fabrik had isolated the upper part of a setting with a layer of breeze, then one of cork, and finally one of stock bricks; and with this arrangement they had obtained a very high heat.

WATER SUPPLY TOPICS AT THE GERMAN ASSOCIATION MEETING.

The report of the proceedings at the Forty-Eighth Annual General Meeting of the Association in Berlin, given in the "Journal" for the 23rd of June, referred very briefly to the papers dealing with water supply, which were presented on the second day of the technical proceedings. Some further particulars may now be given.

Mr. Lindley, of Frankfort-on-the-Maine, presided at this sitting, and first called upon Herr H. Eggert, of Berlin, to give an account of the development and present position of the water supply of the city. The author referred first to previous communications by Herr Beer and Herr Anklam, which gave the past history of the water undertaking of Berlin. He then went on to describe the underground water supplies obtained at Tegel and Friedrichshagen on the Müggelsee. Of the 300,000 cubic metres (66 million gallons) of water required per diem, 80,000 metres are obtained from the former, and 220,000 metres from the latter, source. The fluctuations in consumption are entirely met by the Müggelsee works. In the area of supply, there are now 243 persons per acre, which is twice as many as formerly. The centre of the city is constantly becoming less densely populated, while the population is becoming denser on the outskirts. The underground water supply has decreased the mortality by from 2 to 3 per cent. Infiltration experiments were carried out at Tegel and Müggelsee with a view to ascertaining whether it would be practicable to obtain a supply of underground water in the middle of the town. At Tegel, the *prodigiosus* organism was found in the wells in ten days' time; eight days afterwards it had disappeared. At Müggelsee, the well water showed none of the bacteria which had been introduced into the underground water even in three months' time. On the strength of these results, it was decided to proceed to buy land for the new works at Heiligensee and Wuhlheide.

Professor Dr. Proskauer spoke next with reference to the hygienic evaluation of water, and referred to the earlier work of Gärtner and Renk on the subject. Both for surface water and well water supplies, officially recognized hygienic requirements have been established. These are much the same for drinking water supplies as for those not intended for drinking purposes; but the author considers that, wherever possible, a single water supply should be laid out. As sources of illness, the most important organisms are the typhus and cholera germs. The detection of the former is difficult, and a negative result does not positively indicate that the water is free from objection. Examination in regard to cholera is more trustworthy. Both for shallow and for deep well water it is important to study the local conditions of soil and position. Well water which contains less than 100 organisms per cubic centimetre must not always be regarded as safe; and impounded valley water must always be subjected to bacteriological control. The author then proceeded to go into details of the detection of particular bacteria in water, as, for instance, *bacterium coli*, and then went on to emphasize the importance of chemical examination of the water which, he said, should never be dispensed with. In some cases, however, the bacteriological examination was the more important, and in others the chemical.

It was also necessary, however, that the engineer and the geologist should be asked to collaborate in the investigation.

Professor Thiesing, of Berlin, read a paper on the physical chemical aspect of impounding water. He referred to the importance of various methods of testing water and the effect of storage on its quality as well as the methods of impounding. Speaking generally, he considered that water improved by storage under such conditions.

Next, Herr Debusmann, of Breslau, presented a communication regarding the causes of the water catastrophe in Breslau, and the measures hitherto taken to overcome it. He was followed by Herr Smreker, of Mannheim, who discussed the projected Prussian Water Act. The clauses of this Act are discussed in the report of the Association's Committee on the working of water-works, and the paper was dealt with along with the report.

Herr E. Prinz, of Berlin, then read a paper on artesian well supplies in the North German plain. This paper was, of course, primarily only of local interest, and was largely of a theoretical character.

Herr Reese, of Dörtmund, then presented the reports of the Committees of the Association dealing with water statistics and the working of water-works, of both of which Committees he is Chairman. These reports are dealt with below. It was proposed and at once decided that these two Committees should now be amalgamated and form one new Committee of seven members, with power to add to their number specialists as occasion might arise. The new Committee is to be known as the Committee on the Working of Water-Works; and a grant of 5000 marks (£250) was voted for the work of the ensuing year.

Committee on Water Statistics.

The report opens with a reference to the agreement to amalgamate this Committee with that on the Working of Water-Works, which was subsequently confirmed at the meeting. The Committee decided in future issues of its compilation of water statistics to include, under the heading of "remarks," where particulars are given of the works which remove iron from the water, a statement of the proportion of iron in the untreated water and in the filtrate, and also whether the iron was in combination with humic acid. It was also deemed advisable to indicate in the same place the presence of any other foreign bodies which would affect the filtration of the water. It was further found desirable to make inquiries as to which works had established automatic pressure indicators in their districts. The Committee are of opinion that such district pressure indicators afford a valuable means of control over the working of the distributing system, and give an indication of what is occurring in the several districts which would otherwise be lacking. A question was also raised as to the fuel economizers and mechanical stokers in use at water-works, and their effect on the economy of working and on the avoidance of smoke. The examination of fuel was also considered to have far-reaching significance. Reference was made to the efforts of the Experimental Works of the Association at Carlsruhe to supply information on the composition and value of the fuel, and to make such information available for the different works. The decision previously arrived at to collect statistics as to damage to mains has unfortunately not been acted upon, owing to pressure of other work; but a scheme of procedure has been settled, and the Committee will shortly institute inquiries which they hope will enable them to report on this matter at next year's meeting. It is well known that fracture of mains is frequently caused by changes of temperature; and the questions put will aim at tracing to what extent this occurs. The Committee hope that as many members as possible will reply to these questions on the damage of mains.

The compilation of the nineteenth volume of statistics is being proceeded with. Unfortunately, delay has been caused by the information arriving late; and the Committee urge members to endeavour to supply it more quickly in future, especially as it is intended to issue the twentieth volume at an earlier date in the year. In this volume also a number of new works will be included for the first time.

The report concludes with the resolution which was proposed for the amalgamation of this Committee with that dealing with the Working of Water-Works, and is signed by the Chairman, Herr Reese, of Dortmund.

Committee on the Working of Water-Works.

This Committee have met twice during the past year—once in December in Berlin, and later, in conjunction with the Committee on Water Statistics, in Leipsic. At the first meeting, Herr Wellmann, of Charlottenburg, resigned the chairmanship, which, on the motion of Mr. Lindley, was offered to Herr Reese, of Dortmund—a choice facilitating the amalgamation of the two Water Committees. The amalgamation was discussed at the subsequent meeting; and in view of the overlapping of the work of the two Committees, and of the fact that three members served on both, it was decided to recommend the Association to sanction it.

At the first sitting of the Committee, the project for a new Prussian Water Act was considered, and it appeared highly desirable that the Association should take some action in regard thereto. It is recalled that in 1893 a somewhat similar Bill was brought forward, and a Committee of the Association recommended certain representations to be made to the Minister of the Interior in regard to it. The Bill, however, was withdrawn for other reasons; and the one now brought forward is in many respects undoubtedly an improvement on the earlier one. Nevertheless it has many unfavourable points, and it appears desirable that the Association should take steps to convey its views thereon to the proper quarter. The new Bill is faulty in that it does not give sufficient protection to undertakings supplying from a central source in respect of the rights to underground water in the neighbourhood of private streams as compared with public rivers. The new Bill ought also to deal more effectively with the pumping of large quantities of water by the owners of a comparatively small area of land. It is doubtful also whether the local authorities should be given such extensive powers as they will have under one section of the Bill in regard to the pumping of water from land in private ownership. The question of the extension of the Bill to the whole German Empire, instead of limiting its application to Prussia, was also considered; but the difficulties standing in the way of the application of a general law even to so large a district as Prussia alone, seem very great, and it is doubtful whether the Bill can proceed further at present. Interests in different parts of the Empire are so conflicting and so diverse that it is far easier to deal with the question by local laws. The Committee express a hope that the members of the Association will co-operate in an endeavour to come to a united decision on the points raised by the Bill, and make an effective presentation of them in the name of the Association.

The report concludes with the same resolution as the report of the Committee on Water Statistics.

The Union des Gaz Company and Threatened Strikes.

A Milan newspaper last week reported a movement of discontent and threatened strike on the part of the gas-works' labourers not only in Milan, but also in Genoa and Alessandria. It seems that quite recently an actual strike was averted only by the energetic intervention of the Secretary of the Men's Union. Their Secretary (Signor Speroni) recently gave his account of the present situation. As reported in the "JOURNAL," the Italian gas-workers employed by the Union des Gaz and Continental Union Gas Companies demanded the appointment of some person who should have full authority to settle at once, on behalf of the London Board of Directors, any matters arising in dispute. After a delay of two months (so it is said) the Directors' reply was to the effect that they could not enter into discussion directly with the men's Union; being of opinion that the individual Managers in the different towns are sufficiently capable of dealing with any controversy that arises. Asked why this decision could not be accepted, the Secretary replied: "Simply because the men have little confidence in the local Managers. We do not want strikes, which are injurious to everybody, and especially to the inhabitants who have always given us sympathy and supported us in our fights." The immediate cause of the present threatened trouble seems to arise, on the part of the yard men, from enforced Sunday rest with loss of wages, which is said to be contrary to the *organico* or agreement in force, and contrary to the practice up till recently, when the labourers had to work till two o'clock, and were fined if absent. It is to be hoped that the matter will now be amicably settled without the necessity of any recourse to violent and harmful methods. It is also reported in the newspaper referred to that Signor Lacombe, the Agent-General of the Company in Italy and Manager in Milan, has resigned and will retire from his appointment on Dec. 31 next.

"Cutler" Carburetted Water-Gas Plant in Germany.—Announcement was recently made in our columns that the Dampfkessel and Gasometer Company of Brunswick had made arrangements with Messrs. Cutler and Sons under which they would undertake and carry out contracts in Germany for carburetted water-gas plants constructed on Messrs. Cutler's system. We now learn that the Berlin Municipality have placed with the firm an order for two sets of apparatus, each to produce 20,000 cubic metres of gas per diem; the designs including all their specialities and improvements. We understand that Messrs. Cutler have in hand extensions of the Amsterdam carburetted water-gas plants; also complete new installations at Cardiff and Aldershot.

North British Association of Gas Managers.—The forty-seventh annual general meeting of the Association will be opened in the Masonic Hall, George Street, Edinburgh, next Thursday, under the presidency of Mr. William Blair, of Helensburgh. The business will comprise the presentation of the report of the Committee, the delivery of the President's Inaugural Address, the election of office-bearers, &c. Two papers will be submitted for discussion—one by Mr. J. D. Keillor, of Lochgelly, on "High-Pressure Distribution;" and the second by Mr. R. W. Cowie, of Lockerbie, on "The Financial Difficulties of a Small Municipal Gas-Works." After the meeting, the members and their lady friends will dine together in the Balmoral Hotel, Princes Street. On Friday, a visit (in which ladies will be included) will be paid to the New Grange Meter-Works of Messrs. Alder and Mackay, at the close of which the party will take luncheon in the Palace Restaurant at the Scottish National Exhibition; and the afternoon will be at the disposal of the members.

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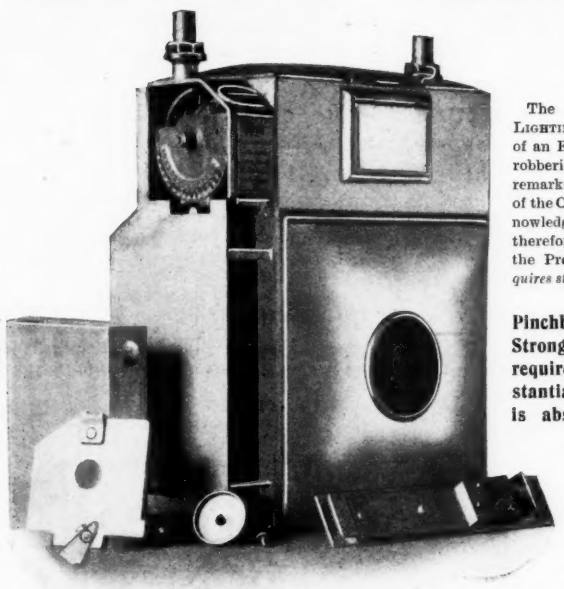

The "JOURNAL OF GAS LIGHTING," in the course of an Editorial Note anent robberies from Slot Meters, remarks: "The Flimsiness of the Coin Meter is the acknowledged tempting fault; therefore, the Coin Box of the Prepayment Meter *requires strengthening.*"

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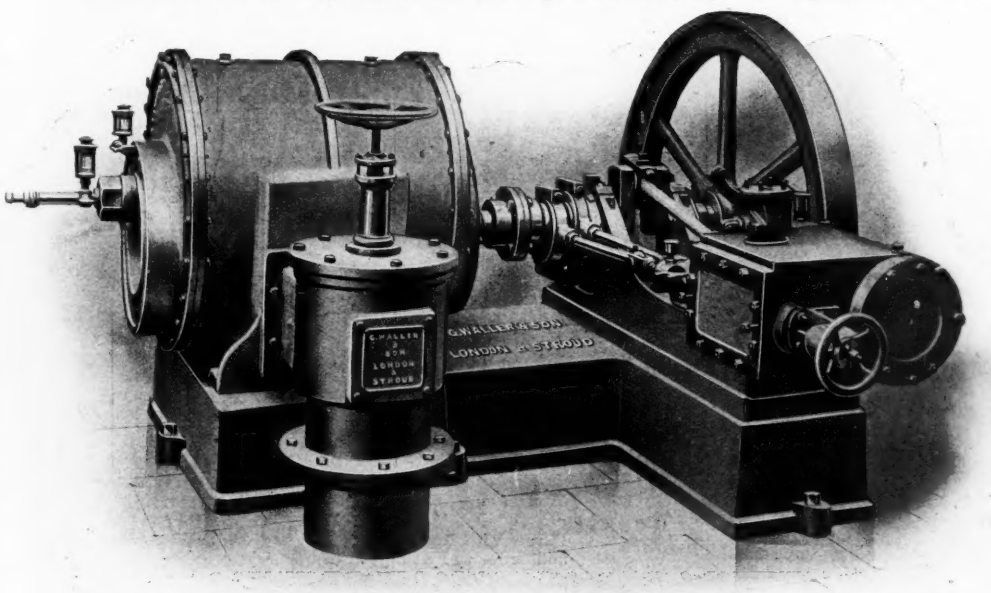

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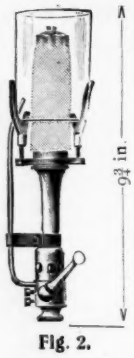

Fig. 2.
Burner with ordinary Bye-Pass Cock and Flashlight.

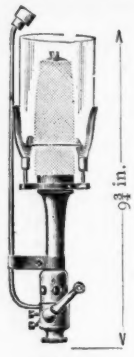

Fig. 3.
Burner with ordinary Bye-Pass Cock, and Carpenter's Patent Single-Tube Flashlight.

Fig. 4.
Burner with ordinary Bye-Pass Cock, Flashlight, and Rings and Chains.

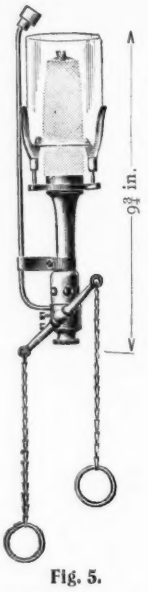

Fig. 5.
Burner with ordinary Bye-Pass Cock, Carpenter's Patent Single-Tube Flashlight, and Rings and Chains.

Fig. 6.
Burner with Lever Cock.

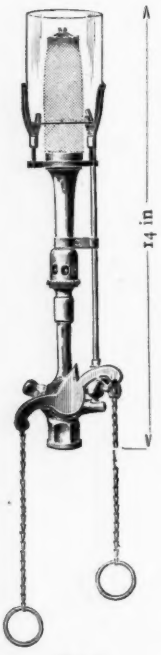

Fig. 7.
Burner with Lever Cock, ordinary Flashlight, Rings and Chains.

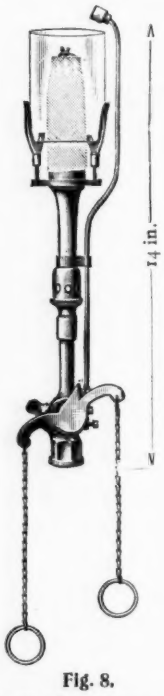

Fig. 8.
Burner with Lever Cock, Carpenter's Patent Single-Tube Flashlight, Rings and Chains.

Fig. 9.
Burner with Lever Cock and Ordinary Flashlight.

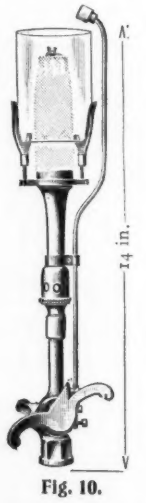

Fig. 10.
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COMMERCIAL ANALYSIS OF FERROCYANIDES.

In the "JOURNAL" for the 12th of May last, we noticed briefly a paper on the above subject read by Dr. HAROLD G. COLMAN before the Society of Public Analysts. The following is the full text of the paper, which is reproduced from the current number of "The Analyst," the official journal of the Society.

Until about twenty years ago, the only soluble ferrocyanide produced on a commercial scale was the potassium salt, obtained by the old method of fusing potash with iron and organic nitrogenous matter; and for the analysis of this salt, the method originally proposed by De Haen (*vide* "Annalen," 1854, 90, 160) was usually employed—namely, titration with standard potassium permanganate, whereby it is oxidized to ferricyanide. Since about 1890, however, owing to the demands for cyanide for the M'Arthur-Forrest gold extraction process, other soluble ferrocyanides, especially those of sodium, and, to a smaller extent, calcium, have been manufactured; a large proportion of these being obtained as bye-products in the coal gas industry from the hydrocyanic acid present in crude coal gas. The use of permanganate for the determination of ferrocyanide in the crude products thus obtained is quite inadmissible, inasmuch as they contain other substances acted on by permanganate, especially sulphocyanide.

A large number of different methods for the analysis of these products have been described, especially in the "Journal für Gasbeleuchtung," but no general account of those mostly in use, and of their comparative value, seems to have been published in the journals dealing especially with analytical chemistry; so that a description of the methods more frequently employed, and of the precautions necessary in their use, if accurate results are to be obtained, may be of value.

TREATMENT OF THE PRODUCT BEFORE ANALYSIS.

The crude products may consist solely of the soluble potassium, sodium, or calcium salts; but more frequently they contain, in addition, insoluble ferrocyanides in the form of double ferrocyanides of iron with these metals or ammonium, the amount of which has to be included in the analytical results. In other cases, such as the spent oxide from gas-works, the whole of the ferrocyanide is present in an insoluble form; and these, when present, must be converted into soluble salts before analysis by treatment with caustic alkalies.

For this purpose a sample is ground, thoroughly mixed, and a quantity of 30 to 40 grammes placed in a mortar with an excess of caustic soda and about 100 c.c. of water, and allowed to stand for several hours, during which time it is frequently well triturated with the pestle. A few crystals of ferrous sulphate may also be added, whereby any cyanide, if present, is converted into ferrocyanide, and any ferricyanide reduced to ferrocyanide. Heat should not be employed, as the products mostly contain both ammonia and sulphides or free sulphur, the latter yielding sodium sulphide by the action of the caustic soda; and in hot solution the alkali sulphides, in presence of ammonia, effect a partial conversion of the ferrocyanide into sulphocyanide, thus tending to make the ferrocyanide results low. In the absence of ammonia, however, boiling sodium sulphide solution has but little action on ferrocyanide. The mixture, when decomposition is complete, is either filtered and made up to 1000 c.c., or it may be at once placed in a litre flask and made up to 1000 c.c. *plus* a quantity of water equal to the volume of the insoluble matter present, which is then allowed to settle, and the clear solution taken for analysis.

Many of the crude ferrocyanide samples, especially if obtained from coal gas, contain, besides ferrocyanides, other complex iron-cyanogen compounds of much less value than the former, the presence of which interferes with all the usual methods of analysis. It will, however, be most convenient to leave the consideration of these compounds and their removal until later, and to deal first with the analysis of the products when the only iron cyanogen derivatives present are the ferrocyanides.

The methods of analysis commonly employed may be divided into three classes, depending upon: (1) The direct estimation of the ferrocyanide present by titration with a suitable metallic salt (copper or zinc sulphate); (2) the estimation of the amount of iron present in the solution and calculating from it the amount of ferrocyanide; (3) the estimation of the amount of hydrocyanic acid present.

1.—TITRATION WITH METALLIC SALT SOLUTIONS.

Of these methods, the first is probably most frequently employed, using copper sulphate as the standard solution, this having been originally suggested by Bohlig ("Polytechn. Notizblatt," 1861, 16, 81), and modified and more completely worked out by Knublauch ("Journal für Gasbeleuchtung," 1889, 33, 450). It consists in titrating the ferrocyanide solution, acidified with sulphuric acid, with a standard solution of copper sulphate, which precipitates the ferrocyanic acid as an insoluble copper salt; the addition of copper solution being continued until a drop of the clear solution no longer gives a blue coloration with a solution of a ferric salt. The copper sulphate solution is previously standardized by means of pure potassium ferrocyanide. If the solution contains sulphide, this is removed before titration by shaking with lead carbonate, and filtering of the lead sulphide and the excess of lead carbonate. In place of copper sulphate, a solution of zinc sulphate is sometimes employed; the method being the converse of that for the estimation of zinc by means of potassium ferrocyanide. This method, when carried out under proper conditions, gives results of fair accuracy; but it is one in which these conditions must be somewhat rigidly adhered to, as otherwise figures may be obtained which are altogether incorrect.

As the solution is acidified with excess of sulphuric acid, the liquid actually titrated consists of a solution of ferrocyanic acid and sulphuric acid, together with the sulphate of the metal originally in combination with the ferrocyanic acid. The reason for the variable results frequently obtained lies in the fact that the reaction does not proceed quantitatively in accordance with the equation—

$$K_4Fe(CN)_6 + 2CuSO_4 = Cu_2Fe(CN)_6 + 2K_2SO_4$$

but, instead, a much smaller quantity of copper is used to effect complete precipitation. The precipitate consists, in fact, not of pure copper ferrocyanide, but of an insoluble colloidal double ferrocyanide of copper and the metal originally present as ferrocyanide; and the proportion of such metal and of the copper contained in the precipitate varies in accordance with the nature of the soluble sulphate present. The same is also true of the precipitates obtained with zinc sulphate.

In order to obtain definite figures showing the extent to which the nature of the soluble sulphate affects the quantity of copper or zinc solutions used, solutions were prepared of copper sulphate, containing 10 grammes $CuSO_4,5H_2O$ per litre, and of an exactly equivalent solution of zinc sulphate, containing 11·51 grammes $ZnSO_4,7H_2O$ per litre, and also solutions of potassium, sodium, and calcium ferrocyanide, containing respectively 4 grammes $K_4Fe(CN)_6,3H_2O$, 4·584 grammes $Na_4Fe(CN)_6,10H_2O$, and 4·813 grammes $Ca_2Fe(CN)_6,12H_2O$ per litre. These ferrocyanide solutions are exactly equivalent, each containing 2·044 grammes of ferrocyanic acid, $H_4Fe(CN)_6$, per litre; and if the reaction proceeded quantitatively, in accordance with the equation given above, 50 c.c. of each of these solutions would require for complete precipitation 23·6 c.c. of either copper or zinc solutions.

The actual results obtained were as follows:—

		$CuSO_4$. c.c.		$ZnSO_4$. c.c.
50 c.c. $K_4Fe(CN)_6$ solution	=	16·4	..	17·00
50 ,, $Na_4Fe(CN)_6$ solution	=	18·0	..	17·30
50 ,, $Ca_2Fe(CN)_6$ solution	=	18·4	..	17·45

From these figures it is manifest what a very important influence the nature of the soluble sulphate present exerts on the amount of copper used, potassium sulphate reducing this much more than sodium, which in turn reduces it rather less than calcium sulphate. The same influence is observable in the case of zinc sulphate; but it is much less marked than with copper.

It follows, therefore, that if, for example, a copper sulphate solution were standardized with potassium ferrocyanide, and then used for titrating a solution of calcium ferrocyanide, the results obtained would be more than 10 per cent. too high. It is therefore an essential condition of accuracy that the copper or zinc solution must be standardized with the same salt of ferrocyanic acid as is used for the titration. This is quite familiar to chemists who are regularly dealing with this method; but, so far as I can ascertain, the fact does not seem to have been published, and, therefore, has not become known generally, owing to which great discrepancies have sometimes occurred in the results obtained with the same sample by different analysts.

A further fact, and one much less generally known, is that not only the nature of the sulphate present, but also its quantity, materially affects the amount of copper or zinc salt required. This is shown by the following tests, using in each case the same quantity of the solutions of potassium, sodium, and calcium ferrocyanide as before, with the addition of varying quantities of the sulphates of the metals:—

50 c.c. of				$CuSO_4$. c.c.		$ZnSO_4$. c.c.
$K_4Fe(CN)_6$ solution	+	0·2 gramme	K_2SO_4	= 15·85	..	17·00
,, ,,	+	1·0 ,,	,,	= 15·50	..	16·90
,, ,,	+	2·0 grammes	K_2SO_4	= 15·10	..	—
,, ,,	+	3·0 ,,	,,	= 14·90	..	—
,, ,,	+	4·0 ,,	,,	= 14·75	..	—
,, ,,	+	5·0 ,,	,,	= 14·60	..	16·40
,, ,,	+	10·0 ,,	,,	= 14·00	..	—
$Na_4Fe(CN)_6$ solution	+	0·16 gramme	Na_2SO_4	= 17·65	..	17·20
,, ,,	+	1·00 ,,	,,	= 17·30	..	17·10
,, ,,	+	5·00 grammes	,,	= 16·70	..	16·80
$Ca_2Fe(CN)_6$ solution	+	0·15 gramme	$CaSO_4$	= 18·20	..	17·35
,, ,,		saturated with	$CaSO_4$	= 18·00	..	17·30

It will be seen that in this case also varying quantities of salt present have a very great influence on the quantity of copper required for precipitation of the ferrocyanide, while the zinc reaction is also affected, though to a smaller extent, and that in both cases the potassium salt has a much greater effect than the sodium or calcium salt. In order, therefore, to obtain correct results by either the copper or zinc methods, it is necessary to have always present approximately the same proportion of salts, both in standardizing the solution and carrying out the titration, as well as to have the same ferrocyanide salt in both cases.

The ordinary practice is to standardize the copper or zinc solutions with pure potassium ferrocyanide, as this salt is the one most readily obtained pure, and is quite stable at all ordinary temperatures. The solutions to be tested are then, before titration, converted into the potassium salt. If calcium ferrocyanide

has to be analyzed, and only small quantities of other calcium salts are present, this is readily done, without adding any material excess of potassium salt, by careful precipitation with potassium carbonate in the cold; and the filtrate may then be titrated, with correct results. To convert the sodium salt into potassium salt, however, this must first be converted (in accordance with Knublauch's instructions) into prussian blue by precipitation with ferric salt, the blue filtered off, and converted into potassium ferrocyanide by decomposition with caustic potash. An excess of the latter is necessary to effect complete decomposition of the prussian blue; and this excess, after filtering and acidifying with sulphuric acid, is converted into potassium sulphate, which is therefore present in the liquid titrated in much greater proportion than in the pure potassium ferrocyanide used for standardizing, and causes the results to come out low. To avoid this error, the copper or zinc solutions should in such cases be standardized with pure potassium ferrocyanide to which potassium sulphate has been added in proportion corresponding to that present in the liquid obtained from the decomposition of the prussian blue precipitate by caustic potash.

I find, however, that for practical purposes this tedious precipitation of the prussian blue is quite unnecessary, and by a simple modification any of the soluble ferrocyanide salts may be directly titrated without complete conversion into potassium salt. It has already been pointed out that potassium salts have a much greater influence on the titration than the others; and it seemed likely that, if an excess of potassium sulphate solution were added to the solution before titration, the influence of any other sodium or calcium salts present would be negligible. Tests made on the lines of those described above have shown that such is the case, as will be seen from the following figures:—

50 c.c. of		$CuSO_4$. c.c.	$ZnSO_4$. c.c.
$K_4Fe(CN)_6$ solution	+ 5 grammes K_2SO_4	= 14·60 ..	16·40
$Na_4Fe(CN)_6$,,	+ 5 ,, ,,	= 14·60 ..	16·40
,, ,,	+ 5 ,, ,, + 1 gramme Na_2SO_4	= 14·60 ..	16·45
$Ca_2Fe(CN)_6$,,	+ 5 grammes K_2SO_4	= 14·65 ..	16·45

If, therefore, the ferrocyanide present in solution is not potassium ferrocyanide, there is no need to remove the other metals, provided that an excess of potassium sulphate is added to the solution. In practice, I add to the solution to be tested 50 c.c. of a cold saturated solution of potassium sulphate (practically 10 per cent. solution), and also add a similar quantity of the potassium sulphate solution to the pure potassium ferrocyanide used in standardizing the copper or zinc solutions; the weight of the latter taken being approximately equal to that which is present in the solution to be analyzed. The analytical results given at the end of the paper were obtained in this manner; and it will be seen that these are in fair agreement with those found from determination of the amount of hydrocyanic acid.

Variations within reasonable limits of the dilution and of the amount of free sulphuric acid present do not materially affect the results. The determination of the end-point of the reaction is one which requires some little practice, and should always be carried out in a good light. Various methods of ascertaining the end-point are adopted, such as filtering small portions of the liquid though Swedish filter-paper, and adding ferric solution to the filtrate, or placing a drop of the liquid on a Schleicher and Schüll drop reaction filter-paper, followed by a drop of ferric solution placed so as to come in contact with the clear wetted portion only of the first spot. Which method is preferred depends largely upon the taste of the operator; but both give good results provided only that the same time is allowed for the development of the blue colour, both in standardizing and titrating. A slightly larger quantity of copper or zinc solution is used, both in standardizing and analysis, if the filtering method is employed.

2.—Determination of the Iron.

The second method employed is that of determining the quantity of iron, and calculating therefrom the amount of ferrocyanide. This method was first proposed by Rose ("Zeit. analyt. Chem.," 1862, 1, 194), and further developed by Leybold and Moldenhauer ("Journal für Gasbeleuchtung," 1899, 33, 153); the ferrocyanide iron being converted into ordinary iron salts by evaporating the dry substance with concentrated sulphuric acid. This procedure is not altogether a pleasant one, and a much more convenient method is that of Dittrich and Hassel ("Ber.," 1903, 36, 1929), which obviates the necessity of evaporating the solution. This consists in slightly acidulating the solution with sulphuric acid (much acid should be avoided, as in that case the decomposition is often not quite complete), adding 2 to 3 grammes of ammonium persulphate, and heating to the boiling-point for twenty to thirty minutes, whereby the whole of the iron is converted into ferric sulphate. Sometimes a slight blue colour persists, which may be removed by the addition of hydrochloric acid and more ammonium persulphate. The solution thus obtained should not be directly titrated with permanganate or bichromate, as products sometimes remain in the solution which affect those reagents, and cause the results to be too high. The solution is therefore precipitated with ammonia, the resulting ferric hydroxide being filtered off, and then either ignited and weighed, or redissolved in acid, and the iron estimated by permanganate or bichromate according to the usual methods. Tests made in the above manner with pure potassium and sodium ferrocyanides, using bichromate for estimating the iron, gave excellent results.

	Found.	Calculated.
Pure potassium ferrocyanide, $K_4Fe(CN)_6,3H_2O$ . . .	13·27 ..	13·23 per cent. of Fe.
Pure sodium ferrocyanide, $Na_4Fe(CN)_6,10H_2O$ . . .	11·58 ..	11·54 ,, ,,

In testing by this method, the assumption is made that all iron contained in solution is present as ferrocyanide; and as 56 parts of iron are equivalent to 422 parts of potassium ferrocyanide and 484 parts of sodium ferrocyanide, it will be seen that even small quantities of iron present in other forms would cause the results to be materially high. According to my own experience, while the method is reliable for the analysis of fairly pure crystals of potassium or sodium salt, containing only small quantities of carbonate or sulphate, it is not suitable for the analysis of crude products, as these, quite apart from the frequent presence of complex iron cyanogen derivatives, other than ferrocyanides, almost invariably contain iron which is not combined with cyanogen at all.

Thus, the ferrocyanide solutions obtained in gas-works, by washing the crude gas with a mixture of ferrous salt and alkali, always contain a soluble double sulphide of iron and the alkali used, which is very troublesome in working up the solution to finished crystals, owing to the separation at late stages of black sulphides of iron, which spoil the appearance of the crystals and necessitate recrystallization. Moreover, when the samples have to be treated with caustic alkali to decompose insoluble ferrocyanides, some iron frequently passes into solution, especially in the case of spent oxide, which contains much organic matter. In all such cases the dissolved iron is included in the analysis, and counted as an equivalent quantity of ferrocyanide, making the results too high. This is well seen in the analyses of samples by the different methods given at the end of the paper, in which the percentages calculated from the quantity of soluble iron present are invariably higher than those found by the other methods. The high result given by this method has been previously pointed out on several occasions. (See Knublauch, "Journal für Gasbeleuchtung," 1889, 33, 451; Bernheimer and Schiff, "Chem. Zeitung," 1902, 26, 227; Luhrig, *ibid.*, p. 1039.)

3.—Determination of the Hydrocyanic Acid.

This method, originally proposed by Rose and Finkener ("Zeit. analyt. Chem.," 1862, 1, 299), depends upon the fact that ferrocyanides are converted into mercuric cyanide by boiling with mercuric oxide, and has been further studied by Drehschmidt ("Journal für Gasbeleuchtung," 1892, 36, 221), and especially by Feld (*ibid.*, 1903, 47, 565), who has worked out an exceedingly convenient and accurate means for the estimation of hydrocyanic acid present as complex iron-cyanogen compounds. This has been used with great success by Messrs. Forbes Carpenter and Linder in their investigation of the composition of ammoniacal liquor. (Forty-first Annual Report on Alkali Works, 1904, p. 29.)

The procedure may be shortly described as follows: A quantity of the solution, prepared as described above, and containing the equivalent of 0·3 to 0·5 gramme of potassium ferrocyanide, is diluted with water in a large flask, mixed with 10 c.c. N caustic soda, and heated to boiling; to this 15 c.c. of hot 3N magnesium chloride solution are added, and the boiling continued for five minutes, after which 100 c.c. of boiling $\frac{N}{10}$ mercuric chloride are added. After boiling for a further ten minutes (not longer), the flask is connected to a condenser, 30 c.c. of 4N sulphuric acid added by means of a stoppered funnel, and distillation continued for 25 to 30 minutes, the end of the condenser dipping under the surface of 25 c.c. N caustic soda placed in the receiver. In this manner the whole of the hydrocyanic acid is obtained as a solution of sodium cyanide in the receiver, the contents of which are diluted to about 400 c.c. A crystal of potassium iodide is added, and the liquid titrated with $\frac{N}{10}$ silver nitrate until a permanent yellow precipitate of silver iodide makes its appearance. One c.c. of $\frac{N}{10}$ silver solution equals 0·0054 gramme HCN; and from this the amount of ferrocyanide is readily calculated.

Presence of Other Cyanogen Compounds in the Crude Materials.

So far, in dealing with the analytical methods, it has been assumed that the cyanogen is all present in the form of ferrocyanide. This is, however, by no means always the case. Occasionally, cyanide and ferricyanide are present in small quantity; but these are unimportant, as they are readily converted into ferrocyanide by the action of alkaline ferrous hydroxide, both by the analyst before analysis and by the manufacturer during the working up of the material. But, in addition to these, many of the products, and especially those obtained from crude coal gas, frequently contain appreciable quantities of carbonyl ferrocyanide. This salt has the composition represented by the formula $Na_3FeCO(CN)_5$, and may be regarded as sodium ferrocyanide in which one molecule of NaCN is replaced by the radical CO. These salts were first discovered by J. A. Muller in spent oxide; and he showed later that they may be obtained by the action of carbonic oxide under pressure on hot ferrocyanide solutions. ("Compt. Rend.," 1887, 104, 994; "Ann. Chim. Phys.," 1889 [6], 17, 93; "Compt. Rend.," 1898, 126, 1421.) Their presence in the

products obtained from coal gas is therefore readily accounted for, as the latter usually contains from 5 to 10 per cent. of carbonic oxide. In chemical properties these salts closely resemble the ferrocyanides, but are readily distinguished from them by the colour of the ferric and copper salts. Thus they yield with ferric salts a deep purple-coloured precipitate or coloration in other respects closely resembling prussian blue; while with copper salts they give an apple-green precipitate in place of the chocolate-coloured compounds yielded by ferrocyanides. The soluble salts are much more soluble than the corresponding ferrocyanides; so that when present in the crude material they accumulate in the mother liquors, and are of but little value to the ferrocyanide manufacturer. The actual quantity of carbonyl ferrocyanide in the crude products has varied in my experience from *nil* to, in exceptional cases, as much as 20 per cent. of the total cyanogen present; but usually the amount in gas-works products varies from 2 per cent. to 5 per cent.

The presence of carbonyl ferrocyanide interferes with the analysis in all the methods described above, as it is precipitated along with the ferrocyanide by both zinc and copper solutions; while the iron in it is estimated along with the ferrocyanide iron and the hydrocyanic acid from it by the Feld method. Naturally, the ferrocyanide manufacturers object to the inclusion of this comparatively valueless material in the analysis as ferrocyanide; but, nevertheless, the removal of these compounds before analysis is frequently not carried out.

For many years past I have employed a simple method of separating these compounds which gives satisfactory results, and depends upon the fact that, whereas ferrocyanides are quite insoluble in moderately dilute alcohol containing 25 per cent. of water, the carbonyl ferrocyanides are readily soluble. To the solution prepared in the manner previously described (which must be alkaline or neutral, not acid), four to five times its volume of methylated spirits is added, when the whole of the ferrocyanide is precipitated, together with any sulphate, carbonate, or chloride present, while the carbonyl ferrocyanide, sulphocyanide, sulphide, and excess of caustic alkali remain in solution. Precipitation is complete in a very short time; but, if possible, it is best to allow the mixture to stand for several hours, as it then filters much more readily. After filtering off, the precipitate is washed with a little methylated spirit, and dried in the water-oven. If calcium ferrocyanide is being analyzed, it is advisable to convert this into sodium or potassium ferrocyanide by adding the corresponding carbonate before adding alcohol, as the dry calcium salt is not very stable at 100°, and loss of cyanogen may occur in drying. The dried precipitate is then dissolved in water, and the solution analyzed in the manner already described.

The solution precipitated with alcohol should not contain more than 10 per cent. of salts, and the proportion of carbonyl ferrocyanide present should not exceed 20 per cent. of the total cyanogen. This is never the case with ordinary samples, but it occurs with the mother liquors obtained in working them up. In such cases it is easier to determine the ferrocyanide by precipitation with lead acetate in slightly acid solution, the carbonyl ferrocyanide not being precipitated by lead salts. The lead ferrocyanide is then decomposed by boiling sodium carbonate solution, and the filtrate from the lead carbonate analyzed.

In the following table will be found the results of the analysis of six samples of crude ferrocyanide by each of the above methods; the first set giving the results obtained without the removal of carbonyl ferrocyanides, and the second set the figures found after their elimination by treatment with alcohol. The nature of the samples was as follows: A. Crude sodium ferrocyanide cake from gas-works, containing insoluble ferrocyanides, carbonyl ferrocyanide, and sulphocyanide. B. Ditto, second sample. C. Sample of crude sodium ferrocyanide, containing large quantities of iron sulphides, but no carbonyl ferrocyanide or sulphocyanide. D. Sample of crude calcium ferrocyanide from gas-works, containing carbonyl ferrocyanide and sulphocyanide, but no insoluble ferrocyanides. E. Sample of spent oxide, containing traces only of carbonyl ferrocyanide. F. Sample made up with known quantities of materials as follows, containing 15 per cent. of $Na_4Fe(CN)_6,10H_2O$:—

	Grammes.
Sodium ferrocyanide, $Na_2Fe(CN)_6,10H_2O$	15
Sodium carbonyl ferrocyanide, $Na_3FeCO(CN)_5,10H_2O$	3
Iron alum	25
Sulphur	20
Bog iron ore	37
	100

The results obtained are given throughout in terms of crystallized sodium ferrocyanide, $Na_4Fe(CN)_6,10H_2O$.

Analysis of Samples without Removal of Carbonyl Ferrocyanides.

	A.	B.	C.	D.	E.	F.	
By $CuSO_4$	69·8	74·5	45·7	94·2	6·2	17·2	Per Cent. of $Na_4Fe(CN)_6,10H_2O$.
,, $ZnSO_4$	69·6	74·4	45·8	94·3	6·3	17·2	
,, Fe	71·6	77·5	49·2	95·5	8·0	18·9	
,, HCN	70·4	74·7	45·9	94·6	6·5	17·4	

Analysis of the Same Samples after Removal of Carbonyl Ferrocyanides by Alcohol.

	A.	B.	C.	D.	E.	F.	
By $CuSO_4$	67·4	71·6	46·2	92·5	6·1	14·6	Per cent. of $Na_4Fe(CN)_6,10H_2O$.
,, $ZnSO_4$	67·6	72·4	45·6	92·1	6·2	14·9	
,, Fe	68·3	73·9	48·9	93·5	7·0	16·0	
,, HCN	67·2	72·4	45·9	92·8	6·3	15·2	

A comparison of the results obtained before and after the removal of carbonyl ferrocyanide shows that the presence of the latter influences the different methods in varying degree; the iron method being more affected than the other three. This is what would be expected, as carbonyl ferrocyanic acid is tribasic, and ferrocyanic acid tetrabasic; so that less metal, proportionately, would be required for the precipitation of the former. This acid also only contains five CN groups in the molecule, instead of six CN as in ferrocyanic acid; and, therefore, in calculating the results from the amount of HCN found, only five-sixths of the amount of carbonyl ferrocyanide is reckoned as ferrocyanide. On the other hand, in the carbonyl ferrocyanide the proportion of Fe : CN is 1 : 5, and in ferrocyanide 1 : 6; so that in calculating the amount of ferrocyanide on the assumption that all iron is present in that form, $1\frac{1}{5}$ times the amount of carbonyl ferrocyanide present is reckoned as ferrocyanide.

As will be seen also from the analysis of C, which is free from carbonyl ferrocyanide, the results obtained before and after precipitation with alcohol agree within the experimental error. The same is true of the sample of spent oxide, E, which was found to contain practically no carbonyl ferrocyanide.

Of the various methods, that giving the most accurate results is the determination of the hydrocyanic acid according to Feld's process. The Knublauch process, whether using copper or zinc solutions, when carried out with the precautions given above, yields results in very fair agreement with those obtained by the Feld method; but there is much greater variation between the results of duplicate determinations, which may differ by about 1 per cent. The iron method, however, invariably gives much higher results with crude products, whether carbonyl ferrocyanides are present or not; and I do not think this method should ever be employed, except with comparatively pure crystals of potassium or sodium ferrocyanide containing only a small percentage of sulphate, carbonate, or similar salts.

The Knublauch method, especially after a little practice, is one which is very readily carried out; and the results are of sufficient accuracy to make it a very valuable one for use in the control of the working of a ferrocyanide plant. As a method of analysis for determining the value of a product as between buyer and seller, where the analysis may have to be carried out by an analyst not in constant practice with the method, it is much less suitable. For such purposes, the Feld method, with the addition of the previous separation of the carbonyl ferrocyanides by means of alcohol, is, in my opinion, the most satisfactory. When once the necessary solutions have been made up, the analysis is readily and quickly carried out; while the titration with decinormal silver nitrate gives a very sharp and easily recognized end reaction, and is one with which nearly all analysts are quite familiar.

Discussion.

Dr. R. Lessing said that it had long been known that in the copper precipitation test certain irregularities occurred; but so far as he was aware, the reason for these had never until now been cleared up, though the presence of indifferent salts was known to influence the reactions. Copper ferrocyanide, as was well known, had a great tendency to form colloid solutions; and, as the author had mentioned, the actual precipitate was a colloidal body. No definite relationship seemed to have been established for the double compound that was formed; but the copper ferrocyanide was probably partly present in colloidal solution and partly precipitated as a hydrogel. What the author really did was to add an electrolyte; and by adding the maximum amount of electrolyte required for the precipitation of the hydrogel from the hydrosol, the end reaction was obtained very rapidly. The fact that when zinc was used the differences were not quite so great seemed to support this assumption; for the tendency to form colloidal bodies was stronger with copper ferrocyanide than with the corresponding zinc salt. The estimation of the iron in the ferrocyanide complex was, as had been pointed out, a good method for pure salts. But with crude ferrocyanide products it was almost impossible to get the alkaline solutions free from iron; and whether ammonium persulphate was used for the decomposition of the iron cyanogen compounds, or strong sulphuric acid according to the method of Moldenhauer, the results were invariably too high. When, however, the ferrocyanide could be isolated pure, the method was a practicable one. The most accurate method was, of course, the distillation method, in which the hydrocyanic acid actually present was estimated. The author's figures showed the great importance that must be attached to the presence of carbonyl ferrocyanide, which at present, rightly or wrongly, was regarded as practically valueless. At any rate, there was no market for it, and probably no use at present; and it was most important it should not be reckoned as ferrocyanide. In dealing with mother liquors containing ferrocyanide, carbonyl ferrocyanide, and sulphocyanide, a useful little qualitative test was to put a somewhat long streak of the mother liquor (possibly diluted) on a filter-paper, and close to it a similar line of ferric chloride solution, when the reaction could be observed in stages—first the formation of prussian blue, then the formation of carbonyl ferrocyanide (indicated by its purple colour), finally the red of the ferric sulphocyanide.

Dr. Monier-Williams asked the best method which the author had found of determining accurately the proportion of carbonyl ferrocyanide. He (the speaker) was in the habit of precipitating the ferrocyanide with lead acetate, removing the excess of lead with sodium carbonate, and precipitating the carbonyl ferrocyanide as iron carbonyl ferrocyanide. The precipitate was

difficult to wash properly, but the method appeared to give good results.

Mr. CHAPMAN (the Hon. Secretary) read a letter from the President, in which reference was made to the question of the presence of carbonyl ferrocyanide in crude sodium ferrocyanide. The President pointed out that representations were frequently made to him by buyers, under contract, of crude ferrocyanide, to the effect that he should exclude the carbonyl ferrocyanide from his analysis on the ground that this compound was of little or no value for the majority of the purposes for which the crude ferrocyanide was used. He (the President), however, had not seen his way to fall in with this suggestion, but for many years had been in the habit of giving the total cyanogen, soluble and insoluble, and its equivalent of dry and hydrated ferrocyanide of sodium. It had always appeared to him that the question of excluding any particular cyanogen compound should be a matter for the contract or of special arrangement come to between the buyer and the seller.

Dr. COLMAN agreed with Dr. Lessing's suggestion as to the nature of the change which the addition of soluble salts brought about. He said he had only had time to deal with the question so far as analysis was concerned, and it undoubtedly called for a great deal more work—in the direction, for instance, of determining the proportions of potassium, sodium, and copper in these various precipitates; and it had occurred to him that it would be interesting to titrate pure ferrocyanic acid with copper salts. As regards the determination of carbonyl ferrocyanide, he had found the Feld method to be the best. On precipitation with alcohol, all the carbonyl ferrocyanide was obtained in the filtrate. On making alkaline, boiling off the alcohol, and treating the residue with magnesium chloride and mercuric chloride, the whole of the cyanide was given off, and the hydrocyanic acid was determined with silver nitrate. He had tried the method mentioned by Dr. Monier-Williams, but had given it up on account of the difficulty of filtering the ferric carbonyl ferrocyanide. To prepare fairly pure carbonyl ferrocyanides from the mother liquors, which were rich in those salts, a quick method was to add an equal bulk of methylated spirit (which precipitated most of the sulphates, carbonates, and all the ferrocyanides), filter, and then an equal bulk of ether. The solution divided into two layers—the bottom layer being a solution of carbonyl ferrocyanide in water, alcohol, and ether, and the top layer a solution of sulphocyanide in ether. The point raised by the President was rather a legal than an analytical one. With a contract merely mentioning "ferrocyanide," he (the speaker) had always contended that it was improper to include carbonyl ferrocyanide, which, though "ferrocyanide" happened to be part of its name, was totally different from ferrocyanide, and was of little commercial value. When, about eleven years ago, he first had to deal with ferrocyanide products, he had never heard of carbonyl ferrocyanide. On his attention being called by the buyers to the mysterious "purple compound" contained in the product, he looked into the matter, and found that this had already been discovered and described by Müller. In the contracts with which he was then concerned, "ferrocyanide" was specified; and it seemed to him right to find out how much carbonyl ferrocyanide there was in the material, and credit the buyers accordingly. It was for the purpose of this determination that the alcohol method described in the paper was worked out.

An Early Dry Gas-Meter.

A copy of "The Civil Engineer and Architect's Journal" for May, 1844, which has lately reached us, contains an abstract of the specification of a patent taken out by Stephen Hutchison, described as of the London Gas-Works, Vauxhall, for a "self-acting aerometer," or dry gas-meter. The apparatus consisted of a cast-iron plate and box with passages leading into four compartments, and thence into the upper part cast in the same, and fitted with four lower cup-valves, which were sealed with quicksilver, and four tin-plate compartments fixed into the cast-iron pipes. Four flexible leather bags, saturated with tar, naphtha, and oil, were attached to the compartments with heads, rods, beams, connecting-rods, cranks, carriages, &c., so as to give motion to the valves and shaft, which revolving communicated with the index. An index, with dial 5 inches square, was enclosed in a box and external casing with brass unions for the inlet and outlet pipes. The hands of the index revolved "similar to those of a clock, the short or hour hand denoting thousands of cubic feet, and the long or minute hand indicating tens of cubic feet." The possibility of escape of "one atom of gas" without it being duly registered by the index, the inventor stated, was entirely obviated by the quicksilver in the cups. Attached to the shaft was a catch, to prevent it revolving the reverse way. It was stated that the instrument not only worked without the slightest resistance to the flow of gas, but assisted its current to the burners. It required the least possible pressure in the mains to work it, and afforded a steady, uniform light without any interference; and the construction was of so simple a nature that its derangement by ordinary means was said to be an impossibility. The valves and the other mechanical contrivances were made of a metallic compound which resisted the action of sulphuretted hydrogen or ammoniacal gases, so that "its duration might be considered to be secured for a very long period." There were likewise no stuffing-boxes whatever to get corroded.

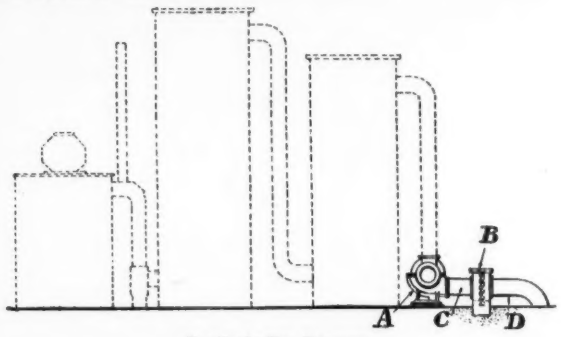
REGISTER OF PATENTS.

Removing Tar from Producer and Other Gases.

BENTLEY, G. H., and HOPKINSON, R. A., of Huddersfield.

No. 13,550; June 12, 1907.

For effecting the removal of the tar and other impurities carried over by the gas from the producer, it has previously been proposed to use a rotary washer and a box (containing perforated plates or partitions) placed near to the washer so that the gas, after passing through the washer, is thrown, with the water, against the partitions in the box, as described in patent No. 1182 of 1903. The present invention consists in placing the combined washer and tar-box at the delivery end of the washing and condensing plant.



Bentley's Tar Remover.

The gas plant is shown in dotted lines, and one example of the position of the washer and tar-box in full lines.

Within the tar-box B, and at right angles to the pipes C, is a series of perforated plates, the holes varying in size. These plates lie a slight distance apart and extend from the lid of the box down to a point near the bottom of the box—their lower edges being water-sealed. The length of the tube C, or the position of the box B to the washer A, is such that, as the gas and water leave the washer, they are thrown against the end plate in the box, and thus keep the holes in the plates clear of tar, which runs down the face of the plate and falls, along with the water, to the bottom of the box, while the gas passes through the holes in the plates to the outlet D.

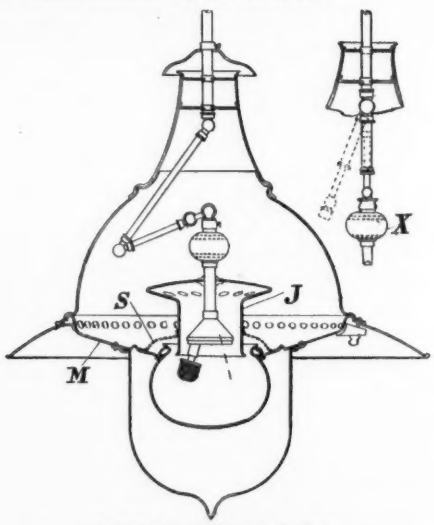
By placing the washer and box where the gas is comparatively cool —*i.e.*, at a point where it has already passed through a condenser or scrubber—the apparatus is said to be "most effective in removing the tar from the gas, and will work continuously without any trouble."

Incandescent Burner Lamps.

HELPS, G., of Nuneaton.

No. 13,648; June 13, 1907.

This invention refers to incandescent gas-burners secured to the lamp reflectors or doors in such a manner that all internal or external parts are accessible for cleaning, regulating, and so on, by opening the door or reflector, without disconnecting the gas supply.



Helps's Lamp-Burner Casing.

In the first form shown, the gas supply to the lamp is connected by swivel arms. X is a perforated draught screen protecting the air cone of the burner; and J is a combined draught inducer and heat diffuser with outlets for the products of combustion to escape into the casing of the lamp. M is the combined hinged door and reflector. There is an inner globe surrounding the mantle, supported by a spring ring. S is a perforated support attached to the burner. The reflector M supports (when closed) the weight of the burner-tube through the support S and draught inducer J.

In the second arrangement, instead of the swivel arms, a sliding tube and stuffing-box are used. The dotted position shows the position taken by the tubes when the lamp is being lowered.

Retort-Furnaces.

RIES, HANS, of the Munich Gas-Works.

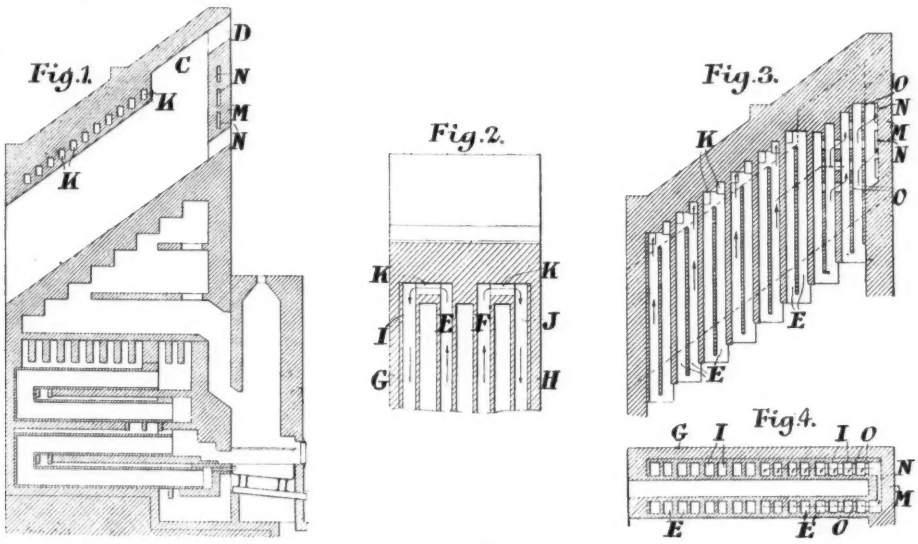
No. 14,341; June 21, 1907.

This invention relates to retort-furnaces having obliquely arranged chambers or retorts charged from the rear—a method of charging (the patentee remarks) required "in cases where there are two or more superposed series of chambers, so that the lower walls of the upper chambers form the roofs or upper walls of the chamber situated below them." The object of the invention is "to enable the chambers to be completely charged up to their roof, and to regulate the heating of the chambers in such a manner that the gas which collects in the upper portion of a chamber is prevented from becoming decomposed."

Fig. 1 is a sectional side elevation; fig. 2, a vertical section of the upper part of the furnace; fig. 3, a vertical longitudinal section through the upper portion of the furnace; and fig. 4, one-half of a horizontal cross-section.

The roofs of the retorts are higher at the upper ends, so that an additional space C is formed above the line followed by the greater part of the roof. Into this widened portion opens the laterally arranged charging shaft D, through which the coal is fed. It is owing to the widening in the highest portion of the chamber that it is possible to fill it completely with coal introduced in an oblique direction through the charging shaft.

The space C is also used as a gas-collecting space, to which a rising-pipe (not shown) for discharging the gas is connected. When the lateral walls and roof of the retort are uniformly heated, the space is at the same temperature as the other walls—a disadvantage, since the heavy hydrocarbons of the gas generated become decomposed by the hot walls of the collecting space C. To avoid this decomposition



Ries's Retort-Furnace.

as far as possible, the conduits for the heating gases are arranged in the following manner: The chambers, which are arranged sidd by side (there are three in the example illustrated), are separatee from each other by the vertical flues or conduits E F, and from the lateral walls G H of the furnace by the vertical flues I J. The flues E and I and F and J are connected at the top by transverse roof conduits K. As seen in fig. 1, these conduits are, however, arranged only in the lower and central portions of the roof, while the lateral conduits E F I J, adjoining the upper portion, are connected to conduits N provided in the back wall M of the furnace. This connection is effected by providing the partitions in the upper portion of the flues E F I J, adjoining the space C, with perforations O, which connect these flues to the conduits N (figs. 3 and 4) provided in the back wall. Owing to this method of conducting the heating gases, direct heating of the gas-collecting space C is avoided; and thus decomposition of the gas collecting there is obviated, and also the back wall of the furnace is in this way heated directly, "so that coals resting against it are completely distilled."

Producing Ammonium Sulphate.

KOPPERS, H., of Essen-Ruhr, Germany.

No. 2399; Feb. 3, 1908.

The process described by the patentee in his specification relates to the manufacture of nearly neutral ammonium sulphate as a solid salt from the gases of the dry distillation or gasification of organic substances, by causing its precipitation at a temperature so far below the normal boiling point of water (and without regarding the temperature of condensation of the steam mixture) that "a decomposition of the neutral ammonium sulphate is impossible, while attaining the maximum affinity between the ammonia and sulphuric acid." To prevent the acid bath from becoming enriched with water at the low temperature employed (which, it is pointed out, must be determined individually for each particular case), the pressure of the steam is lowered, so that, according to well-known physical principles, the point of condensation falls below the temperature of the acid bath. The idea which readily suggests itself to perform the entire process in a more or less complete vacuum, is, however, impracticable, as with the decreasing pressure of the steam, that of the other substances will also fall, so that the quantity of ammonia separating from the neutral sulphate will be increased correspondingly. In this way, no advantage would be gained.

The steam carrying the ammonia is, therefore, mixed with one or more gases in such proportions that the partial pressure of the steam at the desired temperature becomes so low that the point of condensation may be lowered as desired. On the other hand, the proportions must be such that the total pressure (the exterior pressure) is sufficiently high, so that the total pressure is always slightly above the atmospheric pressure. The proper proportions of the mixture may be determined by the law of Dalton, according to which mixtures of gases or gases and vapours act in the same manner as if every single gas would entirely fill the space in question unimpaired by the other gases contained in the mixture. The resulting partial pressures of the single gases make up the total pressure. It is thus possible to prevent the condensation of the steam at any temperature by changing the ratio of the mixture.

Theoretically, any rarefying gas may be mixed with the steam that remains indifferent during the chemical reaction—for instance, nitrogen. With a view of further developing the invention, however, the rarefying or relieving gas mixed with steam carrying the ammonia, may be used in certain instances as a so-called ammonia carrier, so that it may fulfil a secondary object in the process.

With a number of plants for distilling organic substances—such as fuel—there occurs a separation of the ammonia into two parts, while subjecting the raw gases coming from the furnace to a low temperature in order to obtain a rational separation of the tar. One of the parts is that which contains gaseous ammonia. The other part is the water of condensation containing the ammonia (about 10 per cent. of the total quantity) already bound in the raw gas to acids (sulphuric acid or muriatic acid), and containing part of the free ammonia. In contradistinction to the processes hitherto employed, in which the ammonia contained in the gas was washed out with water, the ammonia remains with the present process within the gas, and only the primarily produced ammonia water is passed to a still and treated with steam, to obtain steam containing ammonia, which may be mixed with the distillation gas, forming also a so-called ammonia carrier, after the latter has been freed from tar. In the mixture thus produced, the gas acts as rarefying gas. In this way, a mixture is produced consisting of a large part of gas, a part of steam, and the entire quantity of ammonia. If, owing to the considerable cooling of the gases, the resulting temperature of the mixture is too low to warrant the necessary quantity of steam, the temperature may be raised by heating the mixture or by previously heating its constituents, before the mixture enters the acid bath.

As above described, the gas must be present in the mixture in such proportions and at such a temperature, that it prevents the condensation of the steam contained in the mixture. It must further be able to vaporize the water liberated from the sulphuric acid at the chemical reaction, and carry the steam away, so that a permanently uniform condition of the acid bath is obtained.

Tests have shown that, according to this process, when employed for illuminating gas—*i.e.*, when cooling the raw gases and freeing them from tar, and treating the condensed water with steam and a mixture of the waste gases—the temperature of the mixture is about 29° C., if the gas, as usual, was cooled to about 25° C. On the other hand, the temperature which may be appropriately used for obtaining neutral ammonium sulphate is between 60° and 80° C.—*i.e.*, so low that the gas mixture yields all the ammonia (except traces) to the quantity of free sulphuric acid of the sulphate bath. As during the cooling of the raw gases to 25° C., the entire quantity of water is not condensed, the cooled gas freed from tar constitutes in fact such a gas and steam mixture.

Besides these advantages of the improved process—such as the production of an almost neutral ammonium sulphate in the form of a solid salt—another fact is said to be very important for the practical working of the process. As is well known, ammonium sulphate is partly soluble in acid liquors which are used when producing the ammonium sulphate; the solubility increasing with the temperature. The more salt is dissolved in the acid bath, the thicker becomes the latter, and the greater will be its resistance against the mixture of gas and steam passing through the bath. With the present process, the low temperature involves a reduced solubility of the ammonium sulphate in the acid bath. The solution thus remains more "agile," and ensures more

intimate contact between the gases and bath than heretofore. The consequence is that the quantity of free acid in the product is reduced, while the gas pressure may be lowered corresponding to the decrease of the resistance of the bath.

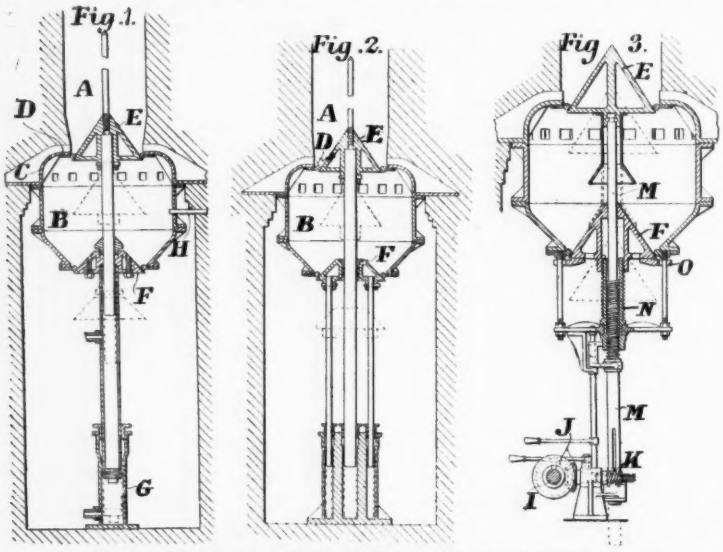
The process has the further advantage that the cyanogen contained in the gas obtained by dry distillation—such as coke-oven or illuminating gas—will not injuriously affect the apparatus through which it passes, such as the meters, &c.—cyanogen acting destructively upon such apparatus in the presence of ammonia and sulphuric compounds. As long as the acid bath contains a slight excess of acid, as it always should, the gas gives up any contents of alkaline reacting substances, such as ammonia, &c. If these substances are absent from the gas, the cyanogen cannot act corrosively within the meters or similar apparatus.

Discharging Continuously Working Vertical Retorts.

BROWNE, A. F., of the Vauxhall Gas-Works.

No. 17,153; July 26, 1907.

This invention is particularly applicable to retorts used in the process of coal distillation with or without the concurrent production of water gas. It comprises the combination with the retort of: (1) A receiver at the discharge end, (2) a conical valve closing the opening between the retort and the receiver and mounted on a vertical spindle, and (3) a conical discharge valve for the receiver, mounted on a shaft concentric with, or shafts symmetrical with, the shaft of the first-named valve, means being provided for sliding the spindles longitudinally to operate the valves alternatively. Provision is also made for introducing steam or water intermittently or continuously to the receiver, which, on coming into contact with the hot residue received from the retort, generates steam which will serve by its pressure to prevent the escape of gas from the retort. The steam generated will, if of sufficient pressure to force its way into and through the incandescent material in the retort, generate water gas, which will pass away with the coal gas.



Browne's Arrangements for the Continuous Working of Vertical Retorts.

Fig. 1 shows one form of the invention designed for a vertical coal-gas retort. The retort A terminates at its base in a receiver B, shown as formed in three parts. The upper part (lined with fire-resisting material) carries the seating D of the upper valve E, while the lower part of the receiver carries the seating of the lower valve F. Both these valves and their seatings (faced and hardened, or formed of chilled castings) are preferably actuated by rams or pistons.

The upper valve E is carried at the upper end of a ram or piston which extends downward through suitable packing in the lower valve F, which is carried by a hollow ram or piston concentric with the ram, of which it forms the cylinder—being closed at its lower end. The ram or piston works in a fixed cylinder G. The arrangement is such that the valves E and F can be separately operated and opened and closed alternately as described; the ram of the upper valve, being under constant pressure during the stroke of the hollow ram, maintains the upper valve E closed, notwithstanding the downward movement of the lower valve F and the hollow ram. H is a supply pipe feeding water either continuously or intermittently.

Suitable means—such as gearing, pulleys, sprocket wheels, spiral guides, or cams—may be provided for imparting rotary motion to the valves, either at intervals or as required for the purpose of ensuring efficient seating of the valves. The rams or the pistons of the two valves are so keyed together that the rotation of the one serves to rotate the other.

As regards the operation of the apparatus, and assuming water to have been fed continuously into the receiver B by the pipe H, the lower valve F is closed and the water accumulates; the upper valve E is opened, and a quantity of solid incandescent residue falls from the retort into the receiver. On coming into contact with the water, steam is generated as described. To prevent excessive steam pressures in the receiver, it may be provided with a relief valve or a hydraulic seal (not shown).

After an interval, the upper valve E is closed, and the lower one F is opened to allow the partially quenched material to fall out to be conveyed away by suitable means. The opening and closing of the valves is so timed that the one is closed while the other is open; the number of movements in a given time being dependent upon the size of the apparatus and the quantity of solid residue it is desired to remove from the retort.

Fig. 2 shows, in sectional elevation, a modified construction of the ram mechanism for actuating the valves, which are arranged as before, but the rams are not concentric; the lower valve F being supported and operated by two rams. Fig. 3 shows a further modification where the valves are actuated by screw-mechanism. The shaft I drives, through clutch and bevel gearing J and a worm K, a worm wheel, which imparts rotary motion through a feather-way to the shaft M upon which the valve E is carried. A screwed part of the shaft works in a corresponding screwed portion of a concentric sleeve N, which is also screwed externally so as to work within a correspondingly screwed recess in the valve F, which is prevented from rotating by lugs O engaging with fixed vertical rods.

Lighting and Extinguishing Lamps.

COWPER-SMITH, A. T., of Tunbridge Wells.

No. 14,551; June 24, 1907.

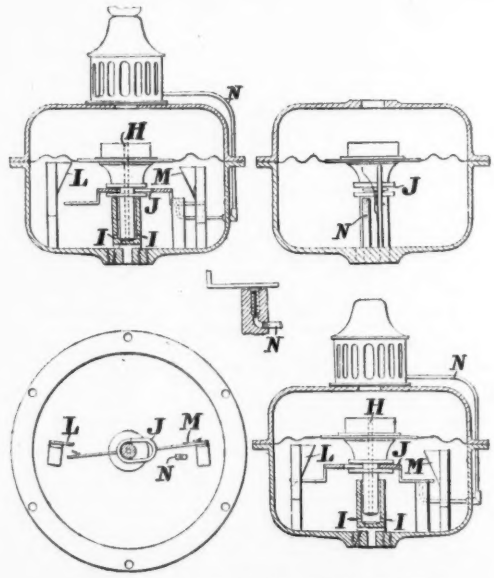
This invention relates to apparatus for enabling gas-burners to be lighted and extinguished by temporary increase of pressure, in apparatus wherein a diaphragm or bell is acted upon by the pressure for operating a controlling valve.

The operation of the apparatus shown is as follows: Assume the valve to be upon its seat, so that the gas cannot pass from the lower to the upper compartment while it is free to flow through the pipe N to the bye-pass burner, and the end of the supporting bar J rests upon its support while the tongue is in engagement with the incline M. If, now, the pressure of gas in the lower compartment is raised sufficiently, it will act upon the diaphragm C and lift the valve off its seat, so that gas is free to flow from the lower compartment through the holes I, and the passage H into the governor. The governor valve is thereby lifted to limit or cut off the flow of gas to the upper compartment, so that the diaphragm will rise to its full extent.

The lifting of the valve also has the effect of lifting the supporting bar J; and as one end of it is acted upon by the incline M the bar is moved longitudinally, so that the other end will be caused to project over the incline. When the bar reaches a certain position, the tongue will pass off the incline M, and the bar be left free.

If, now, the pressure is again lowered, the bar will drop with the diaphragm; but as one end of the bar is over the incline, the incline will guide the bar on to a support—which is at a higher level than the support M, so that the control valve will be held away from its seat and allow the flow of gas to continue. As the end comes on to the support, the tongue passes beneath the inclined surface L. The lowering of the pressure also allows the governor valve to drop, so that gas will flow through the holes I and the passage H into the upper compartment, and thence to the burner.

When the gas is to be extinguished, the raising of the pressure causes the tongue to slide up the incline L, with the result that the supporting bar J is pushed, so that one end is moved from above the incline while the other end is caused to pass above the incline. On the pressure being again lowered, the control valve will drop on to its seat; the end of the bar resting on the support, while the tongue is in position to engage with the incline M at the next rising movement, and so on.



Cowper-Smith's Lamp Lighter and Extinguisher.

The bye-pass pipe N is arranged in conjunction with a pillar O, the top of which is on such a level that when one end of the supporting bar J is upon the support the other end rests upon the pillar, as shown, and cuts off the supply of gas to the bye-pass. Thus the bye-pass only burns when the supply of gas to the main burner is cut off.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Shareholders as Councillors.

SIR,—Referring to the remarks in your issue of July 14 (p. 92), as to the rights of councillors who are shareholders in gas companies to speak and vote on questions of public lighting at meetings of town councils, in which you invite the views of this Association upon the subject, I beg to state that they have had the question before them on more than one occasion.

The Committee are of opinion that, as it is specially provided by section 12 of the Municipal Corporations Act, 1882 (*inter alia*), that a shareholder in a gas company, contracting with a council for (*inter alia*) lighting, shall not be disqualified as a councillor, or be deemed to have any share or interest in such contract by reason only of his having any share or holding in the company so contracting, a shareholder in a gas company who is a member of the municipal corporation is entitled to speak; and if he so wishes, to vote upon the question of public lighting, whether by gas, electricity, or otherwise.

I may add that the position of a member of an urban, or rural, district, or parish council is different, as section 46 of the Local Government Act, 1894, sub-section 2 (*c*) provides that a person shall not be disqualified from being elected a member of any such council by reason of his being interested in any contract with the council as a shareholder in any joint-stock company, but he shall not vote at any meeting of the council upon any question in which such company are interested, excepting where, in the case of a water company or other like company, such prohibition is dispensed with by the county council.

FRED E. COOPER,
Secretary, Gas Companies' Protection Association.
5, *Victoria Street, S.W., July* 17, 1908.

Mr. Bywater's Paper on Refractory Material.

SIR,—We should be glad if you would permit us to correct one statement in Mr. Bywater's recent paper before the Institution of Gas Engineers.

The author states that "the annual cost of refractory material per ton of coal carbonized in gas-works usually ranges from 4d. per ton in the case of direct-fired, to 10d. in gaseous-fired settings." (See "JOURNAL," for June 23, p. 838.) It would be a misfortune if these figures, which appear to have escaped attention in the discussion which followed the reading of the paper, were to be accepted; and the statement that 10d. per ton of coal is the annual cost for repairs might influence some engineers who desire to do away with their direct-fired settings, and replace them with gaseous-fired arrangements.

To better illustrate the figures, and the correction we desire to see made, we have taken the cost not only of the refractory materials, but also of the red-brick material, the labour, and the scaffolding necessary to erect the whole. The example is taken as one bed of eight through retorts, 23 in. by 15½ in. and 20 feet long, forming one of a range of four or more such arches, the length of main flue corresponding, and with the regenerators 9 ft. 6 in. deep.

Cost of One Through Arch and Main Flue Therein.

	£	s.	d.
14,000 9-inch and assorted fire-bricks, at 70s. per 1000.	47	10	0
8 tons of fire-clay, at 18s. per ton	7	4	0
12,000 red bricks, at 30s. per 1000	18	0	0
12 tons of mortar, at 10s. per ton	6	0	0
Centres and scaffolding	6	6	0
Labour in building	32	0	0
Total	£117	0	0

Cost of Regenerator 9 ft. 6 in. Deep, Tile Type.

	£	s.	d.
11,000 fire-bricks, at 70s. per 1000	38	10	0
Tiles, channels, and specials	80	0	0
6 tons of fire-clay, at 18s. per ton	5	8	0
Labour in construction	35	0	0
Cement and sundries	1	2	0
	£160	0	0

Cost of Settings above Regenerator.

	£	s.	d.
8 retorts, 20 feet long, 160 feet, at 4s. per foot	32	0	0
5000 fire-bricks, at 70s. per 1000	17	10	0
Ewell or silica goods	12	0	0
4 tons of fire-clay and loam	4	0	0
Labour in setting, pulling down, and re-fixing iron-work in subsequent resetting.	29	10	0
	£95	0	0

The charge of coal is assumed at 7 cwt. per 20-feet retort, four charges per 24 hours, equal to 1 ton 8 cwt. per retort, or for eight retorts 11 tons 4 cwt.; and it is also assumed that the retorts are worked 250 days in each year, during which time the eight retorts would therefore carbonize 2800 tons of coal. The arches should last twenty years, of 250 days' working, and therefore be available for 56,000 tons of coal. This gives, on the cost of £117, approximately ½d. per ton of coal. The regenerator should last from twelve to fourteen years of 250 days' working, and with repairs to the value of some £60 should last the life-time of the arch (twenty years). This gives on the cost of £220 again divided over 56,000 tons, 0·94d. per ton of coal.

In order to ascertain the cost per ton of coal carbonized for the retorts and settings, it is necessary also to assume their life, and the following table is worked out for the purpose; the cost of £95 being divided over the quantity of coal corresponding to the various days of assumed life:—

Life. Days.	Coal Carbonized. Tons.	Cost per Ton of Coal. Pence.
750 ..	8,400 ..	2·71
800 ..	8,960 ..	2·54
900 ..	10,080 ..	2·26
1000 ..	11,200 ..	2·03
1100 ..	12,320 ..	1·85
1200 ..	13,440 ..	1·69
1300 ..	14,560 ..	1·56
1400 ..	15,680 ..	1·45
1500 ..	16,800 ..	1·35

The total cost per ton for all materials and labour works out, therefore, as follows:—

	Days.		Days.		Days.		Days.
Life of settings	750	..	1000	..	1200	..	1500
	Pence.		Pence.		Pence.		Pence.
Cost of arches	0·50	..	0·50	..	0·50	..	0·50
,, regenerators	0·94	..	0·94	..	0·94	..	0·94
,, settings	2·71	..	2·03	..	1·69	..	1·35
Total	4·15	..	3·47	..	3·13	..	2·79

The figures are given in full, for examination and criticism; and they are based on fair market values, for an area of (say) 40 miles radius from here. If they are correct, it is of interest to note, after 1000 days of working, how little the cost per ton of coal comes down from the extended period.

Some doubt may be expressed as to the balance-sheet value of the life beyond 1000 days. Can it be taken for granted that the coke for sale remains the same in the extended period beyond 1000 days? The examination of the material when taken out from settings after such a period would rather indicate that an increase in the coke consumed would be required to overcome the lessened conductivity of the retorts and sustaining walls, due to the external crustation from the action of the fire. The author's analysis of his flue dust (see "JOURNAL" for June 23, p. 837) has special interest in reference to this crustation. Should there be a loss of coke for sale of ½ cwt. per ton of coal carbonized, this would have four times the value of the saving effected by continuing to work the setting 1500 days. Deducting the cost of the red bricks and labour, it will be seen that the average cost will be from 2¼d. to 2¾d. per ton of coal for refractory materials alone.

Apart from the question of the cost being 2½d. per ton or 10d. per ton, Mr. Bywater's paper has much to interest the manufacturers of fire-clay goods; and there can be no doubt of the desire of the manufacturers to supply such material as will enable them to compete against all comers. But it would be a pity for our German friends to be led to think that the demand is so much greater than it really is. The two leading Gas Companies in London, apart from all others, must require fire-clay goods to the value of £80,000 per annum, in addition to what they now purchase, to reach Mr. Bywater's figures. Needless to say this is a "very big order."

For B. Gibbons, Jun., Limited,
W. P. GIBBONS, Chairman.
Dibdale Works, near Dudley, July 18, 1908.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Tuesday, July 14.

MUNICIPAL FRANCHISE FOR COMPANIES BILL.

On the motion for the second reading of the Municipal Franchise (Mercantile Corporations and Companies) Bill,

Lord AVEBURY remarked that the excessive increase in both our national and municipal expenditure was a serious menace to the prosperity of the country; and, if continued, it must inevitably lead to disastrous results. The national expenditure had risen in twenty years from £90,000,000 to £121,000,000—an increase of £31,000,000—and the municipal expenditure from £54,400,000 in 1886-87 to £139,000,000; being an increase of no less than £84,600,000. So far as municipal expenditure was concerned, the rise might be considered as due, in the first place, to the desire for healthier and happier conditions; and of this increase no one complained. It was, however, felt that there had also been much unnecessary and wasteful spending of money, owing mainly to two causes, one of which was that many of the electors paid no rates. The extravagance and waste had been greatest where this was the case. Not only was it the case that a large number of the voters paid no rates, but a great proportion of the rates was paid by those who had no votes. When the money was spent by one set of people and paid by another, it was not to be wondered at that there was extravagance. The present Bill was intended, in some measure, to mitigate this evil. Resolutions in support of the principle had been passed by the London Chamber of Commerce, the Associated Chambers of Commerce, and the Industrial Freedom League. The Bill had been drafted by the Institute of Directors; and it was supported by upwards of 1500 commercial undertakings. It had the general support of the commercial community, and was based on the axiom that representation should go with taxation. In Leeds, no less than 26 per cent. of the rates were paid by companies which had no vote; in Sheffield, 30 per cent.; in Birmingham, 28 per cent.; in Manchester, 32 per cent.; in Liverpool, 32·4 per cent.; and in the City of London, 50·1 per cent. There was a strong and almost unanimous feeling on the part of those interested in the joint-stock enterprise of the country that in asking for the favourable consideration of this Bill they were only pleading for bare justice. They felt that to give a single vote in any local election to a great institution such as the North-Western Railway

Company or the Gaslight and Coke Company was no adequate recognition of the justice to which they were entitled. The actual votes which would be given by this Bill would scarcely ever determine an election. In some constituencies, indeed, there was a substantial number of companies, and the votes would be not altogether negligible. But votes must be weighed as well as counted; and the effect would not depend on the mere number of the votes. The Chambers of Commerce and the companies believed that the passing of the Bill would promote economy, and that expenditure would be directed with more wisdom and prudence.

Lord ALLENDALE said it had been urged that mercantile corporations and companies could not vote in local elections, and, therefore, could not influence questions affecting the rates to which they so largely contributed. They were all agreed generally as to the principle of representation accompanying taxation. But the Bill was altogether a new departure; and he was not aware that there had been any noticeable demand for the proposals contained in it. Even if it was carried, the noble lord had admitted that such representation as it proposed would hardly meet the case in giving the mercantile corporations sufficient representation to enable them materially to keep down the rates. Moreover, the demand for powers such as were proposed in the Bill, besides being of very recent growth, was contrary to modern legislation. The Bill seemed to have been badly drafted; and it was very doubtful whether it would carry out the intentions of its author. It would confer on some officer delegated by a mercantile corporation one of the municipal franchises; but while it referred to all local authorities, only the schedule related to elections for municipal boroughs. The Government had considered the matter, and had decided that they could not give the Bill their support. The time for its introduction seemed to be inopportune, as the Government had already intimated their intention of introducing, in an early session, legislation with regard to parliamentary elections.

Lord AVEBURY asked whether he was to understand that this question would be dealt with by the Bill the Government proposed to introduce, because unless he received some assurance on this point he would ask their lordships to support the second reading.

The LORD CHANCELLOR said he did not wish to say very much with regard to the Bill, and certainly had no desire to appear as one who objected to any innovation. But the proposition before their lordships was certainly a very strong one. Hitherto votes had been given by men; now they were to be given by combinations of men. It was a mistake to think that the properties specially referred to were not represented. They were represented by their owners, who were all human beings. It was proposed to divorce from the individual personality the responsibility of exercising the franchise, and to put it in the hands of a legal entity. Speaking for himself, he thought it was a very strong proposal, and one of which he did not at all approve.

Viscount ST. ALDWYN thought there was something to be said for the principle of the Bill, because, as a matter of fact, companies were not represented by their shareholders. He suggested to his noble friend (Lord Avebury) whether it was worth while to proceed further, in view of the very decided opposition of His Majesty's Government. They understood that the question would soon arise in the shape of a Bill dealing with valuation and rating in England.

The House divided, and there voted for the second reading, 42; against it, 31—majority, 11. The Bill was then read a second time.

The following further progress has been made with Bills:—

Bill read a second time and committed: Holderness Water Bill.

Bills reported, with amendments: Criccieth Water and Improvement Bill, Liverpool Corporation Bill, Margate Corporation Bill, Padiham Urban District Council Bill, South-West Suburban Water Bill.

Bills read the third time and passed: Glyncorrwg Urban District Council Bill, Wolverhampton Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read a second time and committed: Gas and Water Orders Confirmation Bill.

Lords Bills reported, with amendments: Ammanford Urban District Council Water Bill, Ravensthorpe Urban District Council Bill.

Lords Bills read the third time and passed: Bognor Gaslight and Coke Company Bill, Pontypridd Water Bill.

PORT OF LONDON BILL.

The Position of the Gas Companies.

At recent sittings of the Joint Committee of both Houses of Parliament, presided over by Mr. RUSSELL REA, further consideration has been given to the Port of London Bill (see "JOURNAL," June 23, p. 857).

On clause 1, which creates the new port authority,

Mr. J. D. FITZGERALD, for the promoters, said the first amendment on the paper was that of the South Metropolitan, Commercial, and South Suburban Gas Companies, to leave out sub-section 10. He understood, however, that it had been withdrawn in favour of one by the County Council.

Mr. BUSHE, K.C., representing the London County Council, said the amendment was not withdrawn; but as the amendment of the Council was a little more full than that of the Gas Companies, the latter wished him to open the Council's proposal. He understood, therefore, that the Companies' proposal was standing over. His amendment was to omit from sub-section 10 the words "The first elected members, instead of being elected as provided by this Act, shall be appointed by the Board of Trade after consultation with such persons and bodies having knowledge and experience of trade and shipping in the Port of London as the Board may think fit." The object was to raise the question whether it was necessary and inevitable to nominate those persons who, in the Bill, were called the elected members of the first authority. There was no reason, he suggested, why these persons, so-called elected members, should not in fact be elected. The County Council held, with the Board of Trade, that the general register was to be preferred; and they argued that a general register for the election of the first authority could be formed which would be efficient, satisfactory, and reasonable. In future normal elections there would be four constituents in the electorate —the payers of dues on ships, the wharfingers, the owners of craft, and the payers of dues on goods. The basis of the provision which the County Council proposed to introduce in place of the words they desired to delete was a voting qualification grounded on value. The scale proposed in the amendment provided that where the value of the imported and exported goods, or either of them, amounted to £4800. but did not amount to £12,000, there should be one vote; where the amount was between £12,000 and £24,000, there should be two votes, and so on. It was constructed on the basis that one half-penny in the pound on the value of the exports and imports, for the purposes of voting qualification, might be taken as fairly representing the amount of dues to be paid. No one would have more than ten votes.

Mr. *Edgar Harper*, Statistical Officer to the London County Council, examined by Mr. ROSKILL, was proceeding to give evidence with regard to the question of compiling a general register, when

The CHAIRMAN said the Committee would quite admit that it would be possible to construct a register of payers of dues on ships, also of wharfingers and lightermen.

Mr. ROSKILL: Then there is only the fourth item left.

In further examination with regard to the payers of dues on goods, witness said he thought they would get as good a register on the basis of the value of goods imported and exported as from the amount paid in dues.

Cross-examined by Mr. FITZGERALD, for the promoters, witness agreed that the Customs take no account of coastwise goods, and that consequently there was no record of the value of these.

No further witnesses were called. It having been stated that several bodies had similar amendments on the paper,

Sir R. LITTLER, on behalf of the City Corporation and Messrs. Cory, addressed the Committee in support of the Council's proposal.

Mr. HONORATUS LLOYD, on behalf of the petitioning Gas Companies, heartily supported the amendment. He reminded the Committee that Sir Llewellyn Smith, representing the Board of Trade, when giving evidence, said the promoters themselves held that it was desirable that the elected body should come into existence with all possible speed. On that body in the first years would devolve the important policy of the Board. Sir Llewellyn Smith, again, when asked whether it was impossible that the elected body should come into existence in less than three years, expressed the fear that that was so; obviously showing that the promoters desired to have the elected body as soon as possible. The question seemed to be whether there was any insuperable difficulty which prevented the elected body coming into existence sooner; and he suggested that, on the case put before the Committee by the County Council, there were ways by which it could be done. If the Committee had in mind the adoption of the proposal for representation in respect of the payers of dues, by value, they had precedents in the cases of Rochester and Limerick; the votes in both these cases being regulated under an Act of Parliament by the value of the goods.

Mr. FITZGERALD, for the promoters, argued that the preparation of the schedule of dues on goods, and the obtaining of the sanction of Parliament to it, would occupy eighteen months or two years. Then there must be at least a year for the payment of dues in order that the register of payers of dues might be made up. Thus at least three years must elapse before the election of the first authority, if it was elected on the register which the Bill proposed should be formed. Counsel proceeded to criticize the amendment in some detail, the main objection to which he said was that either all the coastwise goods would have to be excluded from consideration when constructing the register of payers of dues on goods—an impossible proposal—or they would have to accept from every importer of coastwise goods his own statement as to the value of his goods, and the number of votes to which he was entitled. The suggestion that importers of coastwise goods should be called on to prove their claim was not practical. Apparently it was suggested that the value of the coastwise goods was so small as to be negligible; the case of Liverpool being instanced, where the dues on coastwise goods amounted to £30,000 a year out of £600,000, the total dues of the port. The circumstances of the two ports were not comparable. Take the case of coal alone. No less than 8 million tons were imported into London every year, which, at 10s. a ton, gave £4,000,000 as the value. It was to be remembered that the Board of Trade would not nominate the elected members to the first authority off their own bat. By the provisions of the Bill, nomination by the Board was to be made after consultation with the important trading bodies and trade representatives throughout the City of London; and thus the gentlemen nominated would be fully representative of the trade interest of London.

Counsel representing various interests having expressed opposition to the amendment,

The CHAIRMAN, after a brief consultation in private with the other members of the Committee, said: The Committee have decided to reject the amendments to sub-section 10 of clause 1, and to pass it as it stands.

Mr. HONORATUS LLOYD, on behalf of the Gas Companies, said he was anxious to move an amendment with the object of taking out of the Bill the proposed transfer of the docks, and to insert the power to the Port Authority, when it came into existence, to purchase the docks by agreement.

The CHAIRMAN said the amendment was ruled out by a previous decision of the Committee.

Mr. HUTCHINSON, on behalf of the short sea traders, subsequently brought up an amendment proposing that the agreed price should be struck out of clause 3, and that the new authority should be left to purchase the dock undertakings by arbitration.

Evidence in support of this proposal was called, the main point of which was that the proposed purchase price was very high.

Mr. ROSTRON, on behalf of the Gas Companies, supported this amendment. He asserted that, on the evidence of the promoters themselves, the price proposed to be paid for the undertakings was too great.

Ultimately the amendment was rejected.

When clause 5 was reached,

Mr. RAM, representing the Gaslight and Coke Company, proposed, as a proviso: "Notwithstanding anything contained in the Thames Conservancy Act, 1905, or in this Act, the Port Authority shall not be entitled to demand or receive increased duties on tonnage authorized by the first-named Act in respect of more than the first ten voyages in or out of the Port of London in any year of any vessel."

The CHAIRMAN: I think our decision as to feeling ourselves debarred from taking away from the Port Authority any exisiting revenue covers that.

Mr. RAM: May I point out that this arises on what is in effect new matter, because by sub-section (*f*) of clause 5 "So much of the Thames Conservancy Act, 1905, as limits the period during which the increased duties of tonnage authorized by the Act may be demanded and received shall be repealed." What I am asking is that in respect of the number of voyages, in the peculiar circumstances of the coal trade, the increased dues can only be for a certain limited number of voyages, and that after that the vessels may be relegated to the older and lower system of dues, which will pertain at the end of six months.

The CHAIRMAN: Practically the principle is the same. It would be taking away from the Port Authority the powers of taxation which now exist. We feel we cannot do that.

The Committee subsequently dealt with an amendment by Messrs. Cory and Sons, the object of which was to provide that no dues should be levied on coal entering the port.

Mr. *Hamilton Greig*, the Managing-Director of Messrs. Cory and Sons, stated that his firm imported 5 million tons out of the 7 millions of seaborne coal brought annually into London. As he understood, coal coming up the river by steamer was to be liable to a tax. A large amount of business was now done by railways bringing coal to London, where, at the docks, it was tipped into barges and thus distributed. Under the Bill, this method of delivery would be free from taxation. Thus one half of the trade would be taxed for the benefit of the other half. The only way of bringing to London long distance coal from Durham, Northumberland, and Scotland was by sea. From other districts coal came by rail. If a tax was imposed, it would allow the Midland districts to send coal to London.

In reply to the CHAIRMAN, witness added that only a very small proportion of the coal was transhipped.

Mr. *F. H. Dent*, the Goods Manager of the South Eastern and Chatham Railway Company, next gave evidence. If any due whatever was placed on coal coming into the Port of London, he considered it would be very serious. Durham coal might be squeezed out altogether from Kent; and that having been done, the people in Kent might have to pay more for the inland coal. The imposition of even a very small due on coal would disturb the balance of competition between seaborne and railborne coal.

Mr. ROSTRON (representing the Gas Companies): I have a similar amendment. I was going to ask whether I could be heard in support of this amendment. I should like the Committee to have an opportunity of hearing Sir George Livesey.

The CHAIRMAN: No, I think we cannot. We have had the merchants, consumers, and dealers. We understand exactly the consumers' position.

Mr. RAM: May I make a submission? I have an amendment before my friend on behalf of the Gaslight and Coke Company. [Mr. Corbet Woodall, the Governor of the Company, was in attendance to support it.] This I submit does not stand on the same footing as the evidence given for Messrs. Cory. We are not merely private takers of coal, but are carrying on a business. We have to supply the public with gas.

The CHAIRMAN: We fail to see that that strengthens the case at all.

Mr. RAM: At present I have not been allowed to put the point which I wish to urge. My contention is this: We desire to be heard here instead of being sent to the Board of Trade. It is admitted that coal ought to have exceptional treatment, whether in the hands of a private person or in the hands of a company serving the public, as gas companies do. It was admitted also in cross-examination that we get no kind of good by the dredging expenditure on the river. Every penny by which coal is burdened must mean one of two things—either an increase in the price of gas to every person in London, rich or poor, or the postponement of the time when the price of gas can be reduced. We have come here prepared to argue this. We have the evidence to enable us to do it. It is a matter on which the Committee can inform themselves quite as well as the Board of Trade hereafter; and I do ask that we may be allowed to put the evidence before you and have your decision on this point.

The CHAIRMAN: We admit all these points without evidence; they are self-evident. We quite understand the scale on which they apply from the dimensions of your operations.

Mr. RAM: I have put my submission to you; and I take it that you rule that you will not hear me on the point?

The CHAIRMAN: The Committee admit that the petitioners have very strong arguments; but we think that the proper place to urge these arguments is to the Port Authority and the Board of Trade before the construction of the schedule.

Some other amendments having been disposed of, the Committee adjourned.

ELECTRICITY FROM "PEAT GAS" SCHEME.

A Select Committee of the House of Lords presided over by the Earl of DONOUGHMORE (the other members being the Earl of STRADBROKE, Lord DUNBOYNE, Lord HINDLIP and Lord ELPHINSTONE) had before them last Tuesday the Central Ireland Electric Power Bill.

Mr. FREEMAN, K.C., and Mr. JEEVES appeared for the promoters. The only petitioners in opposition were the Alliance and Dublin Consumers' Gas Company, represented by Sir RALPH LITTLER, K.C., and Mr. A. M. PADDON.

Mr. FREEMAN, in opening, said the Bill was one for incorporating and conferring powers on the Central Ireland Electric Power Company, and for other purposes. In some respects it followed the lines which were familiar in Power Bills, but it was interesting and novel in that it proposed to make use of what had now become a thoroughly recognized process abroad—namely, the utilization of peat in a damp condition for generating gas for the production of electricity. The area proposed to be dealt with, which comprised parts of the counties of Dublin and Kildare and of Queen's County, excluded the City of Dublin; the districts being selected because they were within a commercial distance for the purpose of carrying the electricity. The Grand Canal traversed the area in two branches, thus enabling materials to be brought cheaply to the power station and bye-products to be carried away. The promoters had also scheduled an area of 500 acres of peat bog, and had made terms with the owners of the land. Hitherto peat had not been commercially valuable, because it had had to be dried to such a very large extent before it could be used. The figure of 25 per cent. had been accepted hitherto as the commercial basis of dryness in peat. But under the new system it would be a disadvantage for it to be so dried; and it was proposed to use it with a degree of moisture of between 50 and 60 per cent. It would then go straight to the furnaces and produce the peat gas, at the same time giving off bye-products of very great value. For instance, the sulphate of ammonia produced would realize sufficient to cover the entire expense of getting the peat and turning it into gas. The promoters had every confidence that their process, which had been successful in Germany, Norway, and Sweden, would be successful also in Ireland. Certain local authorities were desirous of using the power supply of the Company. Authority was sought to raise £150,000 of capital, and to borrow £50,000 more. As originally introduced, the proposed area included Dublin and the adjoining districts of Rathmines and Pembroke; but these places, together with part of King's County, were now struck out. The petitioners alleged that, "under the powers sought by the Bill, the Company will obtain powers competitive with the existing powers of your petitioners, and will be empowered to interfere with your petitioners' existing mains and works, and with the future laying down of mains and works by your petitioners, and otherwise cause injury to your petitioners." The Gas Company under an Act passed in 1865 had power to supply over a considerable proportion of the promoters' proposed area gas or any other improved means of lighting; and in virtue of these words they claimed power to supply electricity. It was difficult to see how these words could give any such power, inasmuch as the use of electricity for lighting purposes was not known till some fifteen years after the Act of 1866 was passed. Whether or not the power to supply electricity was covered by the words did not matter, however, because although in 1882 the Gas Company purchased some electrical plant of a company who had been working in the neighbourhood and supplied electricity for a short period of years, in 1890 they gave notice to the Board of Trade that they had discontinued the supply of electricity. Thus the Gas Company could not say the promoters would compete with them, because while they supplied light by gas the promoters would supply electric power—a totally different thing. The petitioners further stated: "Not only would the Bill, if passed into law, enable the Company to compete with your petitioners for their existing business of supplying light and power, but the powers proposed to be conferred by the Bill would prejudice your petitioners in the exercise of their existing statutory powers of making and supplying, in addition to gas, any other improved means of lighting for public or private purposes." This really contained the gist of the petition. It was purely and simply a fear of possible competition. The Gas Company's petition continued: "The areas now included in the Bill have no need for a supply of electrical energy; and if and when there be any need for a supply within those areas, your petitioners are willing, and, as they contend, are authorized, to afford it upon reasonable and fair terms as between themselves and the public. . . . Your petitioners are now supplying considerable quantities of gas for gas-engines, whereby electricity is generated on the premises in which it is consumed; and they would point that the passing of the Bill would result in direct competition with them for this part of their business. Your petitioners particularly object to the proposal of the Bill with reference to a supply of electrical energy in bulk to the Blackrock urban district. They are already supplying gas in that district to consumers for lighting, heating, and power; and they are also supplying gas to the Urban District Council under contract for public lighting." With regard to the latter point, the Blackrock Council a few years ago obtained an Electric Lighting Order, and could therefore manufacture and supply electricity. The only reason they desired to take electricity from the promoters was that they could get it more economically in that way. Of course, the promoters would be prepared to meet any reasonable suggestion of the Gas Company with regard to the protection of their mains and pipes.

Captain *Mathew Sankey*, in reply to Mr. JEEVES, said he had paid special attention to the question of the utilization of peat, and had visited Germany to inquire into the subject. His investigations had led him to the conclusion that the scheme of the Bill was perfectly feasible, and would return good profits on the capital. The main characteristics of the scheme were the utilization of peat with 60 per cent. of moisture, and its use on the spot. The peat would be put into a gas-producer; the gas being led by pipes to engines. These engines would work dynamos, to produce electricity. The bye-products, which would be of considerable value, would include sulphate of ammonia, acetate of lime, methol alcohol, paraffin, and two gas oils. The cost of fuel for a peat scheme he calculated was from one-seventh to one-eleventh that of a steam-driven station. Assuming that when the new station was at work there was an output of 16 million units per annum, the saving resulting from the use of peat at 3s. per ton, as compared with the use of coal at 14s. per ton, would be, in fuel alone, a little over £13,000. The scheme could be proceeded with in sections; and an income from the bye-products would be immediately available.

Cross-examined by Sir R. LITTLER: At least £60,000 would have to be spent on plant if the promoters were to rely for income on the return from bye-products, the profit on which would certainly be about 4s. per ton of peat. Such plant could be erected without an Act of

Parliament. The fact that Dublin was cut out of the area of supply would not make it extremely difficult to raise the capital. The scheme of the Bill would not be crippled; but it would be injured—he estimated to the extent of 15 and possibly 25 per cent. or more—if the power to supply light and power in the district of the Dublin Gas Company were cut out. The spot on the Bog of Allan where the works were to be placed was 25 miles from Dublin. The income would be from £6000 to £7000 per annum. It was estimated that Blackrock would take 800,000 units a year, and Kingstown the same.

Sir R. LITTLER: If you do that, you will light all Blackrock. Then there will not be much left for the Dublin Gas Company?

Witness: I do not know; it is not so very large an amount.

In further cross-examination, witness said the electric mains would be carried overhead, and the estimate included the cost of 25 miles of main. If they had to be laid underground, the cost would be prohibitive. The Board of Trade, however, would certainly allow overhead mains, even along a highway, in this case.

By Lord HINDLIP: There was a verbal contract for the supply of about a million units. The other parties would not enter into a contract until the promoters got their Bill.

Mr. *Arnold Lupton*, M.P., civil, mechanical, and electrical engineer, stated that he had had long experience of electrical concerns, and had been connected with several electric power schemes. He agreed with the evidence of the last witness. The failure of previous schemes for the utilization of peat as fuel was due to the necessity for making the peat quite dry—the expense involved having been too great. The fact that peat having a lot of moisture was to be utilized, would cause an entire revolution. The introduction of electricity in the area would not destroy the Gas Company or seriously interfere with their profits. He was aware of the suggestion that the promoters should cut out of their area all the district that was within the limits of the Gas Company. This would exclude some of the places that were most likely to want a supply of electricity for lighting purposes, and certainly the one with which the promoters had an agreement.

Cross-examined by Mr. PADDON: There was a definite demand for electrical energy from Kingstown and Blackrock, and from the Dublin and Lucan Tramways.

Mr. *W. J. Crossley*, M.P., Chairman of Messrs. Crossley Bros., said his works had been driven for 25 years with gas from producers. He had worked one producer at the Openshaw works with peat, with very satisfactory results. He was satisfied that the scheme would be commercially successful. The sulphate of ammonia that would be obtained would more than pay for the peat.

Mr. *John Sturgeon*, Joint Engineer with Captain Sankey to the present scheme, said he had had large experience in connection with power distribution in Lancashire, Yorkshire, and elsewhere. The area of the present Bill was 847 square miles, a considerable portion of which was bog. He gave evidence confirming that already tendered.

Mr. *A. B. Wilson*, one of the Engineers to the Belfast and North-East Ireland Power Gas Syndicate, who are at present erecting works at Portadown for the supply of power gas derived from peat, said the scheme of the present Bill was practical, and would have commercially satisfactory results.

Mr. *Laurence Wickham*, the Chairman of the Blackrock Urban District Council, stated that a provisional agreement had been entered into between the Council and the promoters for the supply of current, in the event of the promoters getting the powers which they were now seeking. There had been a continuous demand for electric lighting in Blackrock, particularly in large private residences. The Urban District Council would use electric power for pumping. The sewage of the district was pumped. At first the pumping was done with gas-engines; the gas consumed being supplied by the Dublin Company. Now suction gas was employed, the plant for which the Council had themselves erected; the saving as compared with the cost of consuming gas from the Company being almost 50 per cent. The benefit of competition was shown by the case of the North Dublin Union, which was lighted by gas supplied by the Dublin Company. The cost for the year before the last financial year was £1087. Last year the Corporation were asked to tender for the lighting of the institution by electricity. Following this, the Gas Company offered to supply the Union with incandescent burners, doubling the volume of light, at a cost of £595; thus saving £492 per annum.

Cross-examined by Sir R. LITTLER: He was not aware that the difference in result at the Union was due to the introduction of a new system; the charge for gas being unaltered.

Mr. *Finlay Heron*, Town Clerk of Blackrock, stated that Blackrock was within the area of the Gas Company. The Council had an Electric Lighting Provisional Order; but the district being so small, they could not manufacture current profitably. They had applied to other bodies for a supply. Negotiations with the promoters had been carried on, with the result that a clause was embodied in the Bill.

Mr. *T. Clarke*, the Chairman of the Rathdown Board of Guardians, said that body had passed a resolution approving of the Bill. The Board had for several years tried to obtain electricity for lighting—which at present was done by oil—but the price was prohibitive. They also approached the Dublin Gas Company; but there was some difficulty about having storage for gas, and the price, though under the estimate from the electric current, was much more than the Board could face.

This closed the case for the promoters; and evidence for the petitioners was at once called.

Mr. *Francis T. Cotton*, Secretary and Manager of the Alliance and Dublin Consumers' Gas Company, examined by Mr. PADDON, said that under the powers granted in 1866, the Company inferred that as an improved means of lighting they had power to supply electric light. In 1882, they bought the only electric installation in Dublin and supplied electricity until 1890; their powers of supply being recognized by Parliament. He assumed there was no manner of doubt about their statutory powers. In 1882, the Board of Trade passed an Act requiring electric wires to be laid underground. All the Company's wires were overhead; and they therefore could not continue the overhead wires without the consent of the Board. They applied to the Board for their consent; but, being opposed by the Corporation, an inquiry was held by, he thought, Major Marindin, who, as the Corporation were applying for certain electric light powers, reported that it would not be advisable to authorize the Company also to lay wires under the streets. The Company therefore ceased to supply electricity.

Mr. PADDON: You ceased because you could no longer supply electric light by overhead wires in the same way as the promoters of this Bill seek power to do?

Witness: Before ceasing, we tried by every means in our power to induce the Board of Trade to allow us to lay these wires. Their answer was that they had no power to do so, except by Provisional Order.

If you are given common powers such as are sought here to-day, or any others, you are perfectly willing to resume the supply of electric light within your area?—Certainly.

Continuing, witness said Blackrock and Kingstown were both sparsely populated residential suburbs of Dublin. There were practically no manufacturers in the districts; and he saw no prospect of large industries being introduced there. Regarded as sources of the Gas Company's business, it would not be advantageous to have any industrial or manufacturing element introduced into them. His Company supplied gas within these areas. He was sure there was no gas company in Great Britain who had spent so much capital in laying mains as they had done. They had done a great deal in pointing out to their customers the advantage of incandescent gas lighting, and had done a lot to induce them to adopt the system. There was no doubt that, apart from æsthetic modifications in the electric light, incandescent gaslight was one of the cheapest forms of illumination. The promotors would have to bring the supply of electricity about 25 miles. Even supposing the wires were erected overhead along the banks of the Grand Canal, they would still have to cover eight or nine miles of public road to get to Blackrock, because though Blackrock was only 3½ to 4 miles from the Canal, they would have to go round the intervening districts; these districts being excluded from the area of supply. If the Board of Trade refused to sanction high-tension services over public roads, the mains would have to be laid underground, which would add enormously to the cost of the scheme. The Gas Company were considerable ratepayers in some of the districts the Local Authorities of which affected to be about to take a supply of electricity. If therefore the supply was taken and afforded to the ratepayers at a loss, the Gas Company would have in part to make good the loss, as they were doing in other districts. The promoters could only hope to attract by way of custom the richest units in the district, and thus their competition with the Gas Company would not be fair; the Gas Company having had to bear the heat and burden of the day.

Cross-examined by Mr. FREEMAN: The electric plant which the Gas Company acquired was quite small. He would accept it that it was 150 H.P. He could not state the amount of electricity supplied or the revenue. The application to the Board of Trade with reference to the wires was that they might carry them underground. The Board said they could not grant the power except by Provisional Order.

Mr. FREEMAN: If it had been a matter to which you attached great importance, you could have applied for a Provisional Order, and then the Board of Trade would have been in a position to grant you the power?

Witness: No. I have explained that we did not apply to the Board of Trade, because that would be an admission that we had not got the powers under our Acts. The fact that the Blackrock Council propose to take electricity from the promoters in bulk instead of going to the expense of generating it themselves will make a serious difference to the Gas Company. Unfair competition would be brought in from 25 miles away; and the Gas Company do not believe that Blackrock can obtain electricity in this way more cheaply than they can make it themselves.

Lord DUNBOYNE: You do not object to their supplying electricity if they make it themselves?

Witness: No.

How does it matter where it comes from—London or anywhere else?—We consider it an unfair competitor to bring into our district.

If it is made outside the district it is unfair; if made within it would be fair?—Yes, under the Provisional Order. We are quite prepared to generate electricity within the district if they like to allow us.

Mr. PADDON, in re-examination: You object to a scheme which you do not believe in coming and deranging your conditions of supply and possibly stopping it?

Witness: Yes; because we have sunk our capital in the district. It is sparsely populated; and we have spent an enormous amount in piping the whole of it.

Mr. *Stephen Sellon*, an electrical engineer, examined by Mr. PADDON, said that as he understood the evidence the promoters stated that the bye-products would be more valuable than even the electricity they could produce. His view therefore was that the Bill should be called a Peat Gas Production Bill, leaving electricity to be the bye-product, as, on the promoters' showing, it obviously was. The scheme as an electrical power scheme was sure to be a very serious disaster, and it was bound to result in whatever they might make on the peat gas side having to go to make up a very large deficiency on the electrical side. It was absolutely impossible to achieve success in distributing electricity in this way at such a distance to such populations as existed round Dublin. The distribution charges alone were more than sufficient to make a loss on any current they might supply to these districts at anything like the rate they proposed. He estimated the sale of the new Company at 850,000 units, which, at 1½d. per unit, equalled £5312. The working expenses, including depreciation and renewals, he calculated would amount to £4996; so that there would be a balance of £316 to meet all the charges on capital, which he put at £65,000. In these figures he had favoured the promoters' scheme as much as possible. He assumed that the consumption per head of the population would be 17 units. In his opinion, the cost of generating current would be 2·32d. per unit—a figure which was prohibitive for power purposes. He did not think it would pay either the Dublin and Lucan or Dublin and Blessington Tramways undertakings to take electricity from the promoters. If the scheme was to proceed, it would be wholly in the interests of the promoters that the area of the Gas Company at that end of the 25-mile cable should be cut out. The cost of transmission would be enormous.

Mr. FREEMAN, in cross-examination: If it is going to be such an

absolute disaster as you anticipate, why should the Gas Company be afraid of their coming?

Witness: I do not know whether the Gas Company thought it was going to be such a serious disaster until I gave them my figures this morning.

Have you ever known a case where the mere opposition of a Gas Company alleging competition has prevented electrical powers being obtained?—I have never known a case of competition successful in my experience; but this is not a question of competition.

Mr. *W. J. Atkinson Butterfield*, F.I.C., said that if power was required for the district in the immediate neighbourhood of Dublin, the power station had better, taking into account the relative cost of coal and peat, be established in that district. In giving evidence in opposition to the scheme, he referred at some considerable length to processes in which peat is utilized.

This closed the evidence.

Sir R. LITTLER, in addressing the Committee on behalf of the petitioners, argued that the portion of the scheme which proposed to give the promoters power to invade the district of his clients must be unprofitable, having regard to the length of wire required to transmit the electricity, and to the improbability of any demand arising except in the case of consumers whom they took from the Gas Company to the depletion of that Company's dividends, and the consequent increase in the price of gas to the public at large. It would be charitable to the promoters if the Committee deleted that portion of the scheme which authorized them to supply in the Gas Company's area.

Mr. FREEMAN, in reply, said the contention of the petitioners amounted to a claim to a monopoly, and to an assertion that the means of lighting in the disputed area should be gas and nothing else. There was no justification on public grounds for refusing to people who desired to use the electric light the opportunity of taking it.

The CHAIRMAN, after a brief consultation with his colleagues, said the Committee had come to the conclusion that they were not prepared to make any alteration in the preamble, and that the Bill should proceed.

The clauses were then adjusted; the usual provision for the protection of the Gas Compny's pipes being inserted.

THE POTTERIES FEDERATION SCHEME.

A Select Committee of the House of Commons, consisting of Sir George White (Chairman), Mr. A. F. Scott, Sir Clement Hill, and Mr. Jowett, have had under consideration the Local Government Provisional Order (No. 3) Stoke-on-Trent Bill, in which there are some interesting proposals with regard to the gas undertakings concerned.

The promoters were represented by Mr. BALFOUR BROWNE, K.C., Mr. RAM, K.C., Mr. C. C. HUTCHINSON, and Mr. B. C. BROUGH. Mr. DANCKWERTS, K.C., Mr. DISTURNEL, and Mr. T. H. PARR appeared for the Staffordshire County Council; Mr. TALBOT, K.C., and Mr. JEEVES, for the Burslem Corporation; Mr. WEDDERBURN, K.C., and Mr. F. N. KEEN, for private owners in the Tunstall district; the Hon. J. D. FITZGERALD and Mr. VESEY KNOX, for the Denton Urban District Council; Mr. HONORATUS LLOYD, K.C., and Mr. R. S. CLEASE, for the Stoke Corporation; Mr. CLEASE, for the Longton Justices of the Peace; and Sir RALPH LITTLER, K.C., Mr. MACMORRAN, K.C., and Mr. J. SHAW, for the North Staffordshire Railway Company.

Mr. BALFOUR BROWNE, in opening the case, pointed out that the object of the Bill was to confirm a Provisional Order of the Local Government Board relating to the boroughs of Burslem, Hanley, Longton, and Stoke-upon-Trent, and the urban districts of Fenton and Tunstall. The proposition was to federate them—to form the whole of them into one borough. This was the Potteries district; and for all purposes, except of local government, the places were one community. The fact that they were all one town had been felt for a great number of years. Everyone saw that the existence of the six separate communities could not go on; and efforts to remedy it had extended over a very long period. What Stoke said was that they wanted federation; but they wished to postpone the transfer of assets like gas-works or electric power works for a period of twenty years. What was said on the other side as against this, for Hanley, Tunstall, and Longton, was that it would not be real federation at all. The latter places desired to have the assets of the towns valued now, because it was just as easy to adjust the matter at once as it would be twenty years hence. But if they had Stoke owning its gas-works—which were remunerative, and from which they obtained considerable amounts of money annually in relief of the rates—it was not true federation. The gas-works ought to be the property of the new borough. In the adjustment which was to be made under the scheme, Stoke would get very full consideration for handing over this asset; and if other towns had not a like asset, they would have to pay a fair proportional portion for becoming part-owners of it. This was the scheme which had been suggested by Sir Hugh Owen, and had been adopted by the Local Government Board. The valuation of assets had been left in the hands of a body of gentlemen. The promoters were Hanley, Longton, and Tunstall; but not all possessed gas-works of their own. Hanley, for instance, was supplied with gas by the British Gaslight Company; and when it brought its assets into the common purse, it would, of course, have no gas-works to bring in.

Mr. *G. C. Kent*, the Town Clerk of Longton, questioned by Mr. HONORATUS LLOYD, said that Longton, Burslem, Stoke, and Fenton had their gas-works; and Hanley and Tunstall were supplied by a Company. What he understood was that there was to be a valuation; and if, speaking for his own town, they had an excess of assets over their proper proportion according to their rateable value in the case of boroughs, and assessable value in the case of urban districts, they would lose that excess. If they had a deficiency, they had to make up the deficiency during the period of twenty years. The valuation of the gas-works would be made by six surveyors. There was nothing in the Order that specified any basis of valuation; and he agreed that there would be an enormous difference according to the basis adopted. Their Borough Surveyor was one of the six valuers; and witness admitted that he had had nothing to do with gas in the ordinary course of his career. It seemed curious that the Order provided that the valuation should be made by six surveyors who knew nothing about the matter, and excluded Counsel and expert witnesses; so that nothing could be explained to them. There were, however, some special provisions in the Order with regard to gas; one being that the loans were to be paid out of profits. He would not agree that if the Order went through, the Stoke consumers who paid for the gas manufactured in Stoke would pay off their own outstanding loans out of their own moneys, and that the other places who contributed nothing would come in and get the gas-works. If there was a valuation, he said, the purchase-money had to be paid; and the profit after the amalgamation would belong to the whole borough. He did not accept the suggestion that while the Stoke consumers were paying off the debts on their own gas-works, they would also have to contribute to paying off those in other places. There was a provision in the Order for keeping the gas at its present price; but the reason for this was that the moment the draft Order was formulated, three of the towns put the charge down to practically cost price. If an undertaking was to be taken over at cost price on a valuation made on the cost, nothing would be paid by the new amalgamated borough for the profits; and therefore the present borough or town that owned gas-works would have their profits taken away on the basis of capital cost, without any compensation for them. It seemed common sense that there was a risk that they should reduce the price of gas so as to take care there should be no profit to be deprived of.

Re-examined by Mr. BALFOUR BROWNE, with regard to the valuation of gas-works, witness said that he had never heard of a going concern that was earning profits being valued upon the cost. The usual principle would be to find out the maintainable income, and multiply this by a certain number of years, having regard to the security for the income.

Mr. *L. L. Grimwade*, a manufacturer, of Wolstanton, near Hanley, said there were parts of Hanley and parts of Tunstall which could be very well served with gas from Burslem without any further capital expenditure on pipes; and there were undoubtedly very great advantages in having the area for the electric supply enlarged.

Mr. *Harry Leese*, a member of the Stoke Borough Council, said that, with regard to the price of gas remaining stereotyped, this was a matter which would right itself. The loans on gas at Stoke were to be paid off out of revenue; and it might be that the revenue would come out of the Stoke consumers.

Mr. *C. H. Yeaman*, the Borough Electrical Engineer of Hanley, was asked by Mr. HONORATUS LLOYD: In the gas provisions, each undertaking has to pay its debt out of the earnings of the particular district; and you have not gas, but you have electricity. Can you tell me why the debt on the gas undertaking, which you have not got, should be paid by the consumers who pay for the gas; and the debt on the electricity undertaking, which you have got, should be paid by yourselves and your partners?

Witness: It would not be by the partners. There is a provision in the Order for triennial revisions of price.

On the case for the promoters being concluded, that for the opposition was proceeded with.

Mr. *W. G. Hodgson*, in support of the petition of the Burslem Corporation, said that in cases where the municipality managed the gas undertaking it was always a question whether they were able to apply their profits in reducing the price of gas for the benefit of the consumer, or in relief of rates for the benefit of the ratepayer. If the Burslem Gas-Works were taken over within the new borough, it would mean that the profits on the works would be made by the consumers for the benefit of Hanley and Tunstall, who had no gas-works. As it was, they obtained the benefit direct.

Mr. *S. Johnson*, the Chairman of the Burslem Gas Committee, said the undertaking was acquired in 1878; the purchase-price being £80,000. Since the concern had been in the hands of the Corporation, £60,000 had been applied out of the gas revenue in relief of the rates, and £35,000 had been spent out of revenue on capital works. In addition, they had paid off the total debt incurred on capital expenditure in connection with the undertaking—£30,780. Taking the matter on the basis of the selling price of 1907, it showed a profit of 8·3d. per 1000 cubic feet. The price of gas had recently been reduced by 6d.; and he believed this charge could be more than maintained. It was most unreasonable that the price should be kept as it stood in 1907, which was the condition laid down in the Order. The interest of Burslem was, taking the question all round, to maintain itself in its present position, because it appeared to him that they had everything to lose and nothing to gain. One of the most valuable assets that Burslem had was its gas undertaking; and he could not see why Hanley and Tunstall should now step in and reap the benefits to be derived from the purchase of the gas-works by their predecessors. It was a most unjust proposal.

Mr. *W. B. Keen*, chartered accountant, gave evidence in support of the petition of the Fenton Urban District Council. In reply to Mr. HUTCHINSON, he said that if the Valuation Board said that the Fenton Gas-Works was a profit-earning undertaking, it would be to the advantage of the six towns to acquire it above its capital cost; but he hoped the Valuation Board would proceed on a different basis from mere capital expenditure.

Mr. *E. H. Stevenson* gave evidence in support of the petition of the Fenton Urban District Council, and Burslem and Stoke. He said he was engaged as long ago as 1883 in valuing the gas-works belonging to Stoke and Fenton, when these authorities separated for gas purposes; and he had also made an inspection of the four gas-works concerned in the present inquiry. All the works were modern. The undertaking at Longton was not altogether progressive; and the others were more or less at a standstill, with the exception of Fenton, which was the only one that was rapidly progressing. He did not anticipate a very large increase in the consumption beyond what the present works could supply—in fact, all the works could supply considerably more gas than was now required of them. At the Fenton works, there was an area of 16 acres of ground, and an output of 750,000 feet of gas per day. The gasholders, purifiers, and all the other plant were in excess of this, with

the exception of the meter and one or two small things. The maximum output was 458,000 cubic feet per day. At Longton there was a very large excess of capacity, due entirely to their water-gas plant. This plant did not pay them to work, because it was much cheaper to make coal gas than water gas in the district. No capital expenditure on any of the works would be required for many years. He did not see that there was any capital expenditure in regard to which economy might be effected by the combination of these undertakings. The works were of such a size that they could be economically managed as separate undertakings; and Fenton, the smallest of them, manufactured gas at the cheapest rate. The net cost of gas at Longton was 14·10d.—that was, the net cost at the consumer's meter. At Fenton the net cost was 14·11d., at Burslem 14·84d., and at Stoke 19·44d. This net cost was arrived at in each case somewhat differently, because of the different circumstances. In Burslem, they charged a rent for ordinary meters; they charged for prepayment meters and stoves and fittings.

The CHAIRMAN said the Committee really could not go into all the various details. If witness said that the cost at Fenton was less than all the rest taken on the same basis, the Committee could very well accept that answer.

Witness replied that it was 2d. per 1000 feet less, taking them all on the basis of Burslem. Continuing, he said that at Fenton they had such a large number of the working class that they did not charge anything for prepayment meters, which was very unusual. So that the working man in Fenton got his gas at the same rate as the richer man, which was not the case in any other place in the United Kingdom. He did not see that there were any economies to be effected in consequence of federation in the matter of gas manufacture and distribution. The works must be maintained, and the capital must be paid in. He did not see where any economy would come about in joining Longton, Stoke, and Fenton; and it was quite impossible to join Burslem and Hanley and Stoke and Fenton. Burslem had no right to lay a main through Hanley. To join up the Stoke and Fenton works would be a difficult engineering job, because it would be necessary to lay the main under the canal or the river. He did not think any economy would be obtained either by shutting up one of the gas-works for part of the year. When it was shown that the smallest works manufactured more cheaply, so much of the personal element came in, as in all manufactures. Where the management was the best, the sale was the cheapest. The Fenton Council had been extremely successful in the management of their undertaking. They had paid off a very large amount of their capital. Only once had they put anything towards the relief of the rates—the money had been used in the extension of the business and in paying off capital. This was why they had been charging a fairly high price for gas until quite a recent date. It would be a hardship if the result of these savings was taken away and given to an area over which they would have but slight control. Under the Order, he supposed that all these savings which the consumers of gas in Fenton had paid out of their own pockets would go to the benefit of Hanley and Tunstall, and the present consumers of Fenton would probably in perpetuity have to assist the rates of Hanley, because before the price of gas could be reduced below what it was in December, 1907, they had to get a two-thirds majority of the new Council. Hanley and Tunstall had more than one-third of the representation; and they were not likely to forego the assistance to the rates from the other towns which they would get from the gas. It was absolutely outrageous that these four towns under the scheme should be forced in the future to assist the rates of Hanley and Tunstall. There were one or two smaller matters in which the provisions in the schedule relating to gas were out of date, and ought to be brought up to modern legislation. For instance, the pressure test was quite insufficient. The Local Government Board had experience in gas matters; but they had taken the old burner, and they had taken the old Model Clauses, which now varied very largely. On the question as to the provisions for keeping the price of gas at what it was, or not reducing it without a two-thirds majority, he said all these undertakings could have supplied gas without loss at a much lower price. Fenton could have sold gas at 2s. and still have made a profit. They were supplying at 2s. 1d. and 2s. 6d., but were not charging anything for public lighting. Now that they were charging for public lighting, they could supply at 2s. All of them could have supplied gas more cheaply.

In cross-examination by Mr. BALFOUR BROWNE, witness said the burner which was in their Act was a 15-hole argand with a 7-inch chimney. It was obvious that there should be one burner—the No. 2 "Metropolitan," which was the modern one.

Alderman *Geen*, the Chairman of the Gas and Electricity Committees of the Borough of Stoke-on-Trent, also gave evidence. He said it was distinctly wrong that the gas-works, for instance, of Stoke should be carried on at a substantial profit by taking the price out of the Stoke consumer, and that the result of the valuation should be that a large part of the value of the undertaking should go to the other towns. Seeing, when the Order was published, that the result might be that the undertakings would be valued on this basis, which would not give the owning borough the price but would give all the benefit to those who would be the purchasers, his Council reduced the price of gas. This was the only way they could see at the moment of protecting their own ratepayers. It was provided by the Order that the earnings of the gas-works should still pay the capital charges in respect of the gas-works; it provided that the second charge upon the revenue should be the loans, repayments, and interest upon loans. So that after the proposed purchase, the consumers of (say) the Stoke Gas-Works would be liable to have the profits of their undertaking applied in this order, and, secondly, towards the capital charges, including the loan charges. There would be continual turmoil in every town where there were gas-works; and there would be dissatisfaction. The Order also provided that the price of gas to be supplied for public lighting should not be less than that charged to private consumers by more than 10 per cent., which was a novel proposition.

After further evidence had been given on the general question of federation,

Mr. BALFOUR BROWNE replied on behalf of the promoters; and the Committee decided to adjourn and give their decision to-day.

LEGAL INTELLIGENCE.

COMPENSATION FOR LAND FOR A RESERVOIR.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Thursday, July 9.

(*Before Lords Justices* VAUGHAN WILLIAMS, MOULTON, *and* BUCKLEY.)

In re an Arbitration between Mr. B. Lucas and the Chesterfield Gas and Water Board.

This was an appeal from the decision of Mr. Justice Bray, last December,* on a special case stated by Mr. Wainwright, the Umpire appointed by the parties, to determine the compensation to be paid by the Chesterfield Gas and Water Board to Mr. Lucas for a certain piece of land required for the purposes of the undertaking. The sum awarded was £1615, of which £779 was allowed in respect of the natural and peculiar adaptability of the land in question to the purposes of a reservoir. Mr. Justice Bray held, in accordance with the opinion of the Umpire, that this adaptability was proper to be taken into account. Against this decision, the present appeal was brought.

Mr. BALFOUR BROWNE, K.C., and Mr. W. M. ACWORTH appeared for the appellants; Mr. SUTTON represented the respondent.

Mr. ACWORTH, in the absence of Mr. Balfour Browne, opened the appeal. He said the case had already come before the Court of Appeal, the Lord Chief Justice presiding, when certain questions were sent to the Umpire with a view to ascertaining more exactly the meaning of certain portions of his award; and these questions, with his answers, would have to be read. Counsel then read the material sections of the various Acts of Parliament which he conceived had a bearing on the question before the Court, and also the award. He afterwards read the answers of the Umpire to the questions sent to him by the Court, which were to the effect that, in fixing the amount of his award, he had not taken into consideration any expenses which might be incurred by a purchaser in obtaining further parliamentary powers.

The rest of the afternoon was occupied in reading and commenting on the judgment of Mr. Justice Bray, and in a discussion between Mr. Acworth and the Bench of various hypothetical cases suggested to him as analogous, which went to show that their Lordships were not favourably impressed with the case for the appellants.

Friday, July 10.

Mr. ACWORTH continued his argument this morning, and submitted that, in considering the adaptability of the ground in question for the construction of a reservoir, one had to bear in mind not only the natural features, but the possibility of any competing purchaser obtaining parliamentary powers for the purpose mentioned. He agreed that the claimant and the Duke of Devonshire could, if the Board were out of the way, combine together and make a reservoir, and each of them would, under the decision in the Marchioness of Ossalinski's case, be entitled to a share of the extra value which the land would thus acquire. But the Board being already in possession of a small portion of the land, on which their conduit was laid, and of statutory powers with regard to taking water, there was practically an impossibility of such a scheme being carried out; and therefore one necessary element of special adaptability was absent.

Lord Justice VAUGHAN WILLIAMS said some members of the Court thought there was a case for sending the award back, on the ground that the Umpire had taken a wrong view of section 40 of the Act of 1895; and he asked Mr. Sutton if he would object to this course being followed. He pointed out that, taking into account all the matters which had been discussed, it was possible the Umpire would increase the amount of the award. One view might be that the value was increased by the mere fact of the contiguity of the appellants' works.

Lord Justice BUCKLEY said he thought the case ought not to go back.

Mr. SUTTON said he should prefer the case not to go back, simply on the ground of expense. The amount of the award was small, and, in his view, inadequate; and he should like to make a few remarks on section 40, in the hope of showing that the Umpire had not really made any mistake of law. If he failed in convincing the Court on this point, he could not object to the case going back.

Lord Justice VAUGHAN WILLIAMS said the majority of the Court were of opinion that the case should go back; but, having regard to the importance of the principles involved, the formal judgment would be reserved, and given shortly.

THE CHARGE OF FRAUD AT SOUTHAMPTON.

Defendant Acquitted.

At the Hants Quarter Sessions last Tuesday, Mr. C. J. Haines, late Resident Engineer at the Southampton Corporation Water-Works at Otterbourne, surrendered to his bail on charges of having obtained by means of false pretences the sum of one guinea on three separate occasions. The facts of the case, as briefly stated in the "JOURNAL" for June 16 (p. 718), were that defendant in certain time-sheets he had to prepare included, at 3s. 6d. a day, a lad who was in his own employ as house boy, and who did not receive the money. The defence was that the amount was charged because Mr. Haines's own pony was engaged on the work with the boy; and that this arrangement really saved the Corporation money, as more would have had to be paid for outside hire of the horse which was admittedly necessary on the work. Mr. W. Matthews, late Water Engineer to the Corporation, said he had always regarded the defendant as a straightforward and honourable man; and Counsel for the defence argued that at the bottom of the case was a man Mr. Haines had refused to keep on the works. The Jury, after a short consultation, found defendant not guilty. No evidence was offered in similar charges relating to other dates; and a formal verdict of "Not guilty" having been returned, Mr. Haines was acquitted on all the indictments.

* See "JOURNAL," Vol. C., pp. 783, 920.

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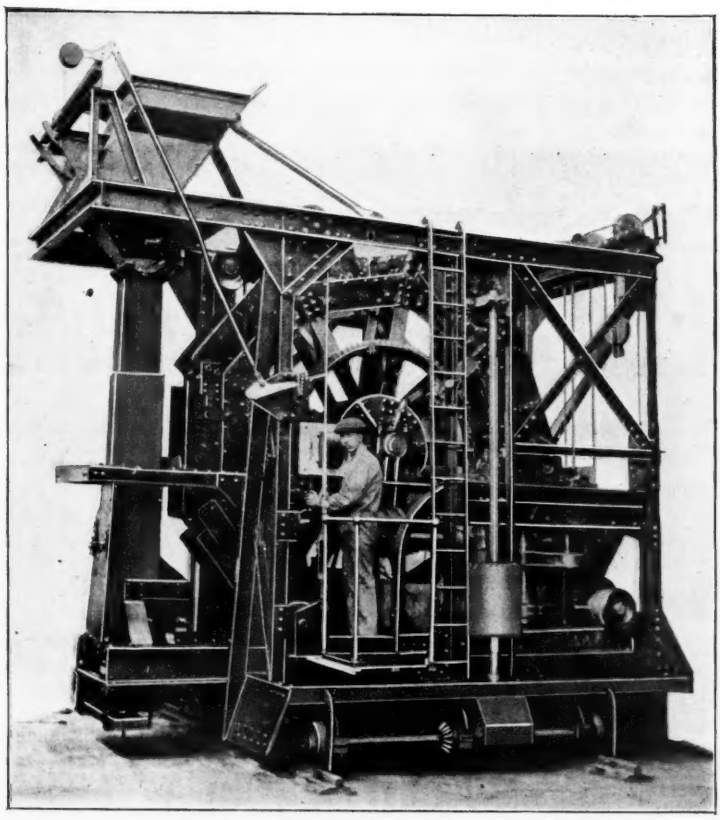

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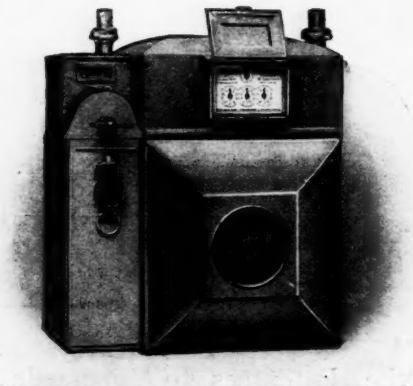

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MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

Authorization to Issue Further Debentures or Debenture Stock.

An Extraordinary General Meeting of the Proprietors of the Association was held last Wednesday at the Cannon Street Hotel, E.C.—Mr. J. HORSLEY PALMER in the chair—to consider and approve a resolution authorizing the borrowing of £761,400 on mortgage, debenture, or debenture stock, in accordance with the provisions of the Imperial Continental Gas Association Act, 1893.

The SECRETARY (Mr. R. W. Wilson) having read the notice convening the meeting,

The CHAIRMAN said: When I spoke from the chair at the ordinary half-yearly meeting in May last, I referred to the Board's intention to ask the proprietors at the meeting next November for authority to issue, as and when required, the balance of the loan capital authorized. In fixing the date of the ordinary meeting as the date also of the special meeting, the Board principally considered the convenience of the stockholders; but I feel that no apology for the alteration will be required of me by those who are acquainted with the present conditions of the Money Market. We have felt in duty bound—even at the risk of some little inconvenience—to avail ourselves of the favourable conditions which now exist. The question of the provision of additional capital is one which has occupied the serious attention of the Board for some considerable time past. It was as far back as 1903 that I foreshadowed the step we are now taking, but, happily, from that time until now—although during that period over one million sterling has been spent upon the extension of the works and mains, and upon the purchase of land—we have been able to meet from the Association's own resources this normal, yet still heavy, expenditure that has been required to meet the demands of the business. A glance at our business records for the same period reveals figures which clearly indicate the necessity for the expenditure of so considerable a capital outlay. In 1903 the percentage of increase upon the previous year was:—

		Gas consumption	5·2	Consumers	8·7
1904	. . . . .	,,	6·9	,,	11·6
1905	. . . . .	,,	6·3	,,	11·1
1906	. . . . .	,,	7·4	,,	11·5
1907	. . . . .	,,	9·4	,,	11·2
	A total in five years of		37·2 per cent.	,,	67·2 per cent.

And we have every reason for believing that the growth of the business in the future will be not less than in the past. The task of Directors of a large gas undertaking in framing their estimates of prospective outlay is not an easy one—requiring, as it does, to a very great degree, the possession of the virtue of "intelligent anticipation." Works have to be put down to meet the maximum demand of a considerable period ahead. This means that there are periods in the existence of a gas undertaking when the immediate outlay of a large amount of money on new works, &c., is required, while the increase in the volume of the business which the works are designed to meet is perhaps a long way off. The Association is now experiencing one of these periods. We have in hand the construction of an entirely new works of large capacity at Antwerp, which will cost over £300,000, and considerable additions both in producing and storage plant to make at several other of the principal works, as Berlin, Frankfort, Hanover, and Brussels. The amount authorized by the Board for capital expenditure during the year 1908 amounts to no less a sum than £480,000, or more than double the average expenditure of the last five years. Your Board of Directors have reason to anticipate that, in the next two or three following years, the expenditure on capital account will also be somewhat abnormal, and they want you to provide the necessary funds. Some stockholder, who has examined the copy of the Association's balance-sheet sent out with the notice of the half-yearly meeting, may remark that there does not appear to be any lack of funds, and that we could possibly go on for some time yet. Gentlemen, it is not the policy of the Board either to divide the profits of the undertaking up to the hilt, or to spend the last halfpenny of its reserves. These reserves, of over two millions sterling—consisting of investments in good solid securities outside the Association's actual sphere of operation—are an additional strength to the Association, and make it one of the best and soundest investments that can anywhere be found. Our present nominal capital stock amounts to £4,940,000, and we have the power under our Act of 1893 to issue loan capital to the extent of one-fourth of the nominal capital stock—to a total, therefore, of £1,235,000. The last occasion when loan capital was raised was in 1893 and 1894, when an amount of £473,600 of 3½ per cent. debenture stock was issued at par, leaving a balance unissued of £761,400. As an indication of the appreciation in which that stock is held, it will interest the stockholders to know that at no time since its issue has the value of that stock (during the most troublous financial period) ever been less than 92; while it has readily changed hands at 106. The highest point reached was £111 5s.—in 1895. This balance of £761,400, we propose to issue in the form of 3½ per cent. debenture stock, in every respect similar to that of 1893 and 1894. It will be a first charge upon the undertaking of the Association, prior to all capital stock, ranking *pari passu* with the existing 3½ per cent. debenture stock, amounting to £473,600. The new stock will be transferable in the same manner, and according to the same regulations, as the said existing 3½ per cent. stock, and will be subject to the same provision—namely, that it may be paid off at any time, at the option of the Association, upon six months' notice being given by the Association, at the rate of £105 for every £100 of stock. The interest will be paid half-yearly—viz., on the 15th of February, in respect of the six months ended the 31st of January immediately preceding; and on the 15th of August in respect of the six months ended the 31st of July immediately preceding. The first payment will be made on the 15th of February, 1909, in respect of the six months from the 1st of August, 1908, to the 31st of January, 1909. To you, gentlemen, who show your interest in the Association by attending to-day, it is perhaps unnecessary to expatiate upon the soundness and value of the investment in this stock; but I cannot refrain from mentioning the advantages, though I will not enlarge upon them. As an indication of the security, I may mention that the profits of the undertaking for the past three years, as assessed to income-tax, and after deduction of income-tax, were—for 1905, £566,681; 1906, £577,877; 1907, £591,067. So that you see there is a very wide margin between the amount of our annual profits and the £43,225 which will represent the interest at 3½ per cent. per annum upon the total debenture stock issue of £1,235,000. We propose, if you give us the necessary authority, to issue this stock at the low price, in our opinion, of £92 per cent.—a figure which, you will remember, I previously informed you is the lowest at which the debenture stock of the Company has ever stood. At the price of 92, the £761,400 stock will realize a sum of £700,488, and the return to the holder will be at the rate of £3 16s. per cent. The last occasion when the authority of the stockholders for borrowing powers was sought was in 1893. We were then able to issue our debenture stock at par, and, though we only applied to our own proprietors, who, at that time, were numerically considerably less than now, we received applications for more than double the amount. The Directors hope that the present stockholders, to whom the stock is offered in the first instance, will now, as then, show their appreciation of the value of the undertaking in which they are interested, and take up the whole of this issue of £761,400. The Directors have such faith in the value of the investment, and in the appreciation of the stockholders, that they have not thought it necessary to obtain any outside assistance by way of having the issue underwritten. I, therefore, beg formally to submit the following resolution to the proprietors—viz., "That the Directors be, and they are hereby, authorized to borrow a sum of £761,400 on mortgage, debenture or debenture stock, in accordance with the provisions of the Imperial Continental Gas Association Act, 1893, on such terms and conditions, and at such time or times, as they may think best in the interests of the Association."

The DEPUTY-CHAIRMAN (Mr. Arthur Lucas) remarked that he had much pleasure in seconding the motion, but, thanks to the clear statement of the Chairman, the only point of which he thought he ought to remind the proprietors was that from the point of view of the Association—that was, from the point of view of the proprietors—this was by far the cheapest way of raising the large sum required. By the issue of debenture stock, they would only be paying interest at the rate of 3½ per cent.; whereas if the Directors had issued the large amount as ordinary stock, they would have had to pay a higher rate. No doubt the proprietors knew all about this; but he thought it better to remind them of the fact.

The motion was unanimously carried.

In pronouncing the business of the meeting concluded,

The CHAIRMAN remarked that, after this resolution, there would be no necessity for a confirmatory meeting, in view of the Association's Special Act of Parliament.

EUROPEAN GAS COMPANY LIMITED.

The Annual General Meeting of the Company was held last Tuesday, at the London Offices, Finsbury House, Blomfield Street, E.C.—Mr. R. HESKETH JONES in the chair.

The SECRETARY and GENERAL MANAGER (Mr. W. Williams) read the notice convening the meeting, and also the following report of the Directors:

The Directors have the pleasure to report an increase in both the quantity of gas sold, and the rental, at all the Company's stations. The particulars of the improvement in rental are as follows: Amiens 1½ per cent., Bolbec 8 per cent., Boulogne 4 per cent., Caen ¾ per cent., Havre 5½ per cent., Nantes 4 per cent., Rouen 6 per cent.; making in the aggregate an average of 4·39 per cent. The price of gas has recently been reduced at Boulogne and Nantes, with the result that the percentage of increase in rental there is less than the percentage of the quantity sold; the latter being 9 per cent. and 8 per cent. respectively.

Coals have cost more than during the previous year; but the difference has been recouped to a considerable extent by the enhanced prices obtained for coke. The revenue from tar has been somewhat less. The value of sulphate, however, has been fully maintained.

The Directors in their last report to the shareholders referred to the purchase of some land and buildings at Nantes. A portion of this land has been reserved for the erection of a gasholder; and the remainder, with all the buildings, has been let on satisfactory terms. The Directors have since acquired some property adjoining the Company's works at Nantes, which, together with the last-named, will enable them to carry out some needed extensions of plant, and make ample provision for future requirements. The Board have also acquired more land at Sotteville, where some extensions to the works will shortly be necessary.

The satisfactory results of the year's working enable the Directors to recommend the payment of the same dividend and bonus as last year—viz., a dividend of 20s. per share on the fully-paid shares, and 15s. per share on those £7 10s. paid, less the interim dividend of 1cs. and 7s. 6d. per share respectively paid on Feb. 1 last; also a bonus of 2 per cent. on all shares according to the amount paid thereon, subject, however, to a deduction for French stamp and transfer duty of 1s. 1d. per fully-paid share, and 10d. per share £7 10s. paid, in respect of all shares held in France.

Notice has been given that two Directors (E. F. White, Esq., and N. E. B. Garey, Esq.) and both Auditors (J. Reeson, Esq., and A. T. Eastman, Esq.) retire from office at this meeting; but, all being eligible, they offer themselves for re-election.

The CHAIRMAN, in moving the adoption of the report, said when a Company was continuously prosperous, there was little left for a Chairman to say to the shareholders, beyond heartily congratulating them on their possession of such good property. The Directors' report just read informed the shareholders that the increase in the rental during the past year had been 4·39 per cent., notwithstanding reductions in the selling price of gas at Boulogne and Nantes. The report called attention to what was well known—that the cost of coal

had been greater in the past year than during the previous two years. Of this extra cost, nearly two-fifths had been recouped from the increased value of coke. It would naturally be asked how it was that, with this increased cost of coal, the profits of the Company were sufficient to pay the same dividend and bonus as last year. The explanation was this: During the years 1906 and 1907, the Company purchased coal under a two years' contract entered into in 1906. Shortly afterwards, the price of coal advanced, and also the value of coke; thereby considerably increasing the profits. In short, they had two fat years, and took the advantage of largely increasing the annual sum necessary to be set aside for depreciation, especially of meters and fittings; so that during the past year, it had not been necessary to provide for this depreciation, except to a very small extent. He might also state that the Directors had not found it necessary to add more than a nominal sum to the guarantee and insurance fund, as a very substantial amount was already standing to its credit. He might add to the information contained in the report that there was an increase of 6 per cent. in the total quantity of gas sold, an increase of 6¾ per cent. in the rentals of meters and fittings, an increase of 3½ per cent. in the number of private consumers, and a decrease in bad debts and cost of exchange of upwards of £1000, as compared with last year. The Company's concessions averaged 27 years. The Directors kept in view those that were below the average, and lost no opportunity of treating with the several local authorities for extending them, and, as the Directors' report had informed the shareholders, of acquiring land and property for the extension of the Company's business.

Mr. N. E. B. Garey seconded the motion.

Mr. C. P. Crookenden asked whether the Directors saw any objection to sending the accounts, with the report, to the shareholders before the meeting. Of course, they were allowed to attend at the office and make a copy of the accounts; but it would save a lot of trouble if they were circulated among the shareholders. Every other company he knew of did this.

Mr. H. E. Jones: There is a great difference between this Company and an English one.

Mr. Crookenden: It is the European Gas Company; and the Continental Union Gas Company now distributed their accounts.

Mr. H. E. Jones: We have not permanent possession like an English Company.

The motion was unanimously carried.

The Chairman proposed a resolution declaring a dividend of 20s. and a bonus of 4s. per share, in accordance with the terms of the recommendation in the report.

Mr. E. Felix White seconded the proposition, which was agreed to.

Moved by the Chairman, and seconded by Mr. H. C. Smith, the retiring Directors (Mr. E. F. White and Mr. N. E. B. Garey) were re-elected, as were also the Auditors (Mr. J. Reeson and Mr. A. T. Eastman), on the proposition of Mr. H. J. Luff, seconded by Mr. Uriah Cossey.

The Chairman, in proposing a vote of thanks to the officers and staff, said he was placed in rather an awkward position, by having Mr. Williams there, as he could have said a good deal more about him than it was possible for him to do in his presence. He was a valuable officer, and without him the Company's success would not have been what it was. Regarding the Managers abroad, Mr. H. E. Jones had recently been on the Continent, and had seen the officers at the stations; and so he would ask him to second the motion. He (the Chairman) had also had the pleasure of seeing the Managers, during their visit, as members of the Société Technique, to the Franco-British Exhibition and to Bournemouth, a fortnight since.

Mr. H. E. Jones, seconding the motion, said the General Managership of a large undertaking of this kind required a gift which few men possessed, but which they found in Mr. Williams, who gave the most assiduous and painstaking attention to his office. It was important to the Company to have such service. The Chairman had referred to the visit that he (Mr. Jones) had paid to the Continent with Mr. Williams. Abroad the Company were served in just the same way as they were at the London office. He should have liked the shareholders to have seen their Engineers and Managers when they were over here at the Franco-British Exhibition; he was sure they would have been very gratified. With regard to the inner working of the Company, the production of gas and residuals, arising from the work of these gentlemen, was practically unrivalled. In saying this he was speaking carefully. He was a man of statistics, and through them had to compare the working of one undertaking with another. These gave them exactly the means of testing how far works were not only in good order, but as to how far they were producing the best results. The Company were fortunate in their Managers. The Chairman had given the shareholders some reasons as to why the shareholders had good dividends. There was another; and it was because the Chairman was the Chairman. He had taken great care that no money was wasted even for that vaunted object to which Sir George Livesey had recently called attention—the craze for displacing labour by machinery whether or not it paid. In this Company, their Chairman allowed them to do nothing of the sort.

The motion was unanimously carried.

Mr. Williams, responding for himself and the staff, said he found it difficult to give expression to his gratitude for the very kind remarks that had been made. He could only assure the shareholders of his devotion to the Company's interests. The vote would be conveyed to the gentlemen of the staff abroad; and they would thoroughly appreciate it. They did their best in the Company's interests; and the results showed they were not entirely unsuccessful.

Mr. A. T. Eastman, in moving a vote of thanks to the Chairman and Directors, said the fact that the Chairman came to a full stop so soon after commencing to speak was significant. It was generally found that a company had been very prosperous when a chairman quickly came to an end of what he had to say at general meetings. It meant success. There was no other reading of it. And the Chairman and his colleagues together had kept this Company in the forefront of successful gas companies.

Mr. J. Reeson seconded the motion; and it was cordially passed.

The Chairman, on behalf of himself and colleagues, expressed deepest gratitude for the vote and the remarks accompanying it.

This concluded the proceedings.

PROPOSED REDUCTION IN PRICE AT BIRMINGHAM.

The Birmingham Gas Committee have prepared a report for presentation at next week's meeting of the City Council, in the course of which they state that they have entered into contracts for the coals required during the current year on more favourable terms than obtained in the past year. A careful estimate of the income and expenditure for the financial year which terminates on March 31 next enables them to recommend the Council to reduce the charges for gas consumed after the Michaelmas index readings of the meters, as follows: For lighting and heating purposes, in one premises: Under 50,000 cubic feet per quarter, from 2s. 6d. to 2s. 4d. per 1000 cubic feet; between 50,000 and 250,000 cubic feet per quarter, from 2s. 3d. to 2s. 2d.; between 250,000 and 1,000,000 cubic feet per quarter, from 2s. to 1s. 11d.; for 1,000,000 cubic feet and upwards per quarter, from 1s. 10d. to 1s. 9d.; less 5 per cent. discount for prompt payment. For motive power purposes: Under 100,000 cubic feet per quarter, from 1s. 10d. to 1s. 9d. per 1000 cubic feet; 100,000 cubic feet per quarter and upwards, from 1s. 7d. to 1s. 6d.; less 5 per cent. discount for prompt payment. For supplies of gas through prepayment meters: With gas fittings and cookers free, from 26 cubic feet to 28 cubic feet per penny; with cookers free, from 31 cubic feet to 33 cubic feet per penny. The charges thus reduced for gas consumed between October and March next ensuing will aggregate £28,000; and, in making the above recommendation, the Committee anticipate they will, while maintaining the works and plant of the undertaking in a state of efficiency, be able to contribute, as in each of the past six years, a sum of not less than £50,000 in aid of the improvement rate of the city. The new schedule of prices will secure a reduction of at least 2d. per 1000 cubic feet in the price to be charged for gas to fully 95 per cent. of the consumers on the books of the department, and of 1d. per 1000 feet to the remainder

NOTTINGHAM NEW GAS-WORKS SITE.

The Nottingham City Council have decided to purchase, for the purpose of erecting thereon new gas-works, the Bulwell Hall Estate. some particulars with regard to which were given last week (p. 124).

The matter came before them at their meeting on Monday of last week, when Mr. A. Ball, the Chairman of the Gas Committee, moved the adoption of the report of his Committee recommending the purchase. He said the Committee had for some years been looking for a new site; but until now they had been unsuccessful in securing one suitable. It was intended to purchase the land out of the reserve fund; the Committee having no idea of asking for a loan. If the site were purchased, the Council would have nearly a square mile of land at practically 3d. a yard, with a mile of frontage to the main road from Bulwell to Hucknall. At present this road was in some places not more than 20 feet wide; and there was no doubt that if the land were not purchased now, when the Council came to buy the frontages it would cost, not 3d. a yard, but 5s. or 6s. The gas-works would only require 100 of the 574 acres comprised in the estate; leaving an enormous area which could be developed at a large profit for bringing new works into the city, and for providing allotment gardens for the many hundreds of people in the district, to whom they would be of great advantage. They could sell the land to the public at such a price that every working man in the city who wanted to become his own freeholder would have no difficulty in doing so. At the same time, they could protect themselves against any trouble in years to come similar to that which they had had from time to time at Basford. The troubles at the works there had been more than many members of the Council were aware of; and the difficulties were bound to continue so long as they made gas at Basford. He hoped the Council would see the wisdom of accepting the offer, because he could assure them that, as an estate, the land would produce as much from rents as their investments with the reserve fund were bringing in to-day, so that if they looked at the matter simply as an investment for the reserve fund they were doing the right thing. If they regarded it as they ought to do, as a City Council, they would be doing what they should have done years ago with the reserve fund.

Mr. Gregg remarked that he would like the land to be bought on the distinct understanding that the Gas Committee did not spend any money in construction without asking the Council for their consent. He referred to the possibility of sinkage, and the rapid strides that electricity was making for lighting, power, and heating purposes—saying it was a question whether by the time the Basford works were old they would not want an electricity works instead of a gas-works.

Sir Edward Fraser thought that the circumstances attending the purchase ought, in the interests of everybody, to be made perfectly clear. When the purchase first occurred to the Chairman of the Gas Committee, he took the right course in consulting him, as Chairman of the Finance Committee, as to whether anything should be done in the matter. This was before a single step was taken. Such members of the Council as could be readily got together discussed the matter, and went into the whole thing most carefully; and in the result they were unanimously of opinion that the purchase ought to proceed. It was agreed that Mr. Ball, acting entirely in the interests of the Corporation, should carry out the purchase; and the point he wished to make clear was that there was not a purchase by Mr. Ball and a subsequent sale to the Corporation, but a purchase by him as agent for the Corporation—one contract to enable the purchase to be carried through. Mr. Ball ran some degree of risk, inasmuch as the Council might foolishly throw the contract back upon his hands. He considered Mr. Ball had given great assistance to the town, and conferred a great public service, by carrying the matter through. As to the merits of the case, it was waste of time to discuss them. In the course of a few years they would undoubtedly require a very large area for a site for a new gas-works; and in his judgment if they went for parliamentary powers to acquire a site of 100 acres, they would have to pay as much as they were paying for the 600 acres they would acquire by this scheme. The land would be of great advantage to the town for

many reasons. It was entirely suitable for the provision of allotments, recreation grounds, and a hundred and one matters which the Corporation might have to undertake. It was very low-priced, and might be very useful in attracting to the town the manufacturers of which it stood in such sore need.

Mr. Ward estimated that the cost of transplanting the gas undertaking to Bulwell would run to half-a-million of money, and criticized the proposal on the ground that the new site was at an altitude of 160 feet above the Eastcroft works, which would necessitate driving the gas down to consumers. He also asked the size of the mains required to distribute the gas from Eastcroft, of those from Basford, and of those that would be needed from Bulwell.

Sir Joseph Bright thought the purchase would be a fine investment for the gas reserve fund, though the site was rather too far out for gas-works, and the cost of distribution would suggest that one nearer the town would be more desirable. Even supposing that the estate remained as it was, it would pay more interest to the gas reserve fund through its rental value than if the fund were invested in Consols. He very cordially supported the report.

Mr. Ball, in reply, said Mr. Ward could have a detailed account of the sizes of all the mains in Nottingham at a future meeting, if he gave proper notice.

An amendment to defer the matter for a month was lost, and the report was adopted by an overwhelming majority.

SOUTHPORT CORPORATION GAS SUPPLY.

The Gas Engineer and Manager of the Southport Corporation (Mr. John Bond), in his annual report, states that in the financial year ended March 31 there was a steady augmentation in the sale of gas, chiefly due to the large number of fires and cookers fixed during this period. It amounted to 30,904,000 cubic feet, or equal to an increase of 6·32 per cent. on the previous year's consumption. The gas sold through penny-in-the-slot meters was 9·56 per cent. of the entire bulk. Of the total quantity of gas supplied by meter, the Southport consumption was 343,567,800 cubic feet, or 80·49 per cent.; the Birkdale consumption, 76,372,000 cubic feet, representing 17·89 per cent.; and the remainder was consumed in the Ainsdale, Banks, and Scarisbrick districts. The total receipts for the year for gas supplied to private consumers in Southport amounted to £49,078; the average price paid being equal to 2s. 6·85d. per 1000 cubic feet. In Birkdale the total receipts from private consumers came to £13,369. The plans have been passed for the completion of the new retort-house; and when the whole is finished there will have been added to the carbonizing plant three additional regenerative settings of retorts, capable of manufacturing 2,040,000 cubic feet of gas per day. A new engine-house has been erected; and the foundations are being prepared for exhausters capable of dealing with 120,000 cubic feet of gas per hour. The quantity of gas made during the year was 542,352,000 cubic feet, and 3·15 per cent. of it was unaccounted for. The number of gas-cookers in use at the end of the year was 7114, against 6287 on March 31, 1906. The gross profit was £31,576; and the net profit, £14,320.

At the monthly meeting of the Town Council last week, the Chairman of the Gas Committee, Alderman Travis, called attention to the report, and remarked that he was pleased to say that, notwithstanding the increased price of coal, they had come out with a profit of about £1300 more than they did a year ago. There had been a considerably greater quantity of gas made from coal and less by the carburetted water gas plant than was the case the previous year. During the past year they made 55 million cubic feet of carburetted water gas; whereas in the previous year they made 151 millions. This would account for a very much larger amount of coal being used last year than in the previous year. While carbonizing materials showed an increased cost of £4373, using more coal and less oil, the actual cost owing to the increased price was about 1s. 5d. a ton. If they put this into figures, on the quantity they used, it was about £3000, which was the extra sum they had to pay on account of the rise in the price of coal. Of course, 1s. 5d. per ton did not represent anything like the rise that took place in the price of coal. But the Committee anticipated that coal was more likely to go up than down; and in the previous year they had bought considerably more than a twelve months' supply. Consequently, while the cost of coal went up something like 2s. 6d.—between that and 3s.—a ton, owing to the quantity which had been bought earlier, the cost worked out to about 1s. 5d. a ton more. There was an increased income from gas sold of £3956, as they had sold over 30 million cubic feet more than they did the previous year. The amount received from residuals—£5651—did not represent an increased price of residuals so much as the fact that, when making coal gas, they had more residuals than when they made water gas. This would be borne out when he told them that the amount of coke for sale was nearly doubled—that was, in round figures they had 20,000 tons instead of 10,250 tons as in the previous year. This was owing, in the first place, to making more coal gas, which yielded more coke, and manufacturing less carburetted water gas, in which they used coke for the purpose of manufacture. It was also accounted for to a large extent—and this was the point he wished to impress upon them—by the economical use of the coke in their new retort-settings as compared with the old ones. The new settings used considerably less coke, and consequently they had £2000 or £3000 worth more coke to sell than they would have had under the old conditions. This was one of the savings they got by adopting a modern and up-to-date plant. With regard to the items of expenditure, there was a decrease of £1390 for wages for gas making. This was owing to the fact that during the previous year, when the retorts and machinery were "down," there was a considerable amount of hand-stoking. The previous year showed an increase of £1185 for wages, which was due to hand-stoking. The net profit was £14,320, against £13,000 the previous year. The Gas Committee had determined to carry forward £1320 to next year. They did not know whether they would be quite as successful next year as they had been this year, although they hoped to be. The amount of superannuation and sick pay distributed was £506. This was a decrease of £59 on the previous year, and was practically the same as the year before.

HEREFORD GAS-WORKS RESULTS.

Some weeks ago, when proposing an increase in the salary of Mr. W. W. Townsend, the Gas Engineer and Manager to the Hereford Corporation, Mr. Charles Witts, the Chairman of the Gas Committee, gave an indication of the good results that had been achieved by the past year's working; and Mr. Townsend's annual report now issued fully bears out what was then stated.

In the report, it is pointed out that the principal features of the twelve months' working are an increase of over 3,000,000 cubic feet in the amount of gas sold; a further reduction of 1,000,000 cubic feet in the gas lost by leakage, and the heavy increase in the cost of coal, which was, however, met by the improved returns from residuals, by extra revenue from sale of gas, and by various reductions in the expenditure. The gas sold totalled 120,158,000 cubic feet, which is a record. The increase on the previous year's consumption is 3,336,450 cubic feet, or 2·7 per cent. The number of ordinary consumers increased during the year by 49, and the number of cookers on hire and hire-purchase by 90. The gross profit for the year is £4381, against £4262. The gas-rental shows an increase of over £200, in spite of the further reduction of the price of gas for power which came into force during the year. The net income from automatic meters is about £220 more, and the net income from residuals £983 more—partly owing to the higher price received for coke and partly to the better results obtained from the sulphate of ammonia plant. The net profit on the manufacture of sulphate of ammonia for the past four years has been as follows: 1905, £324; 1906, £320; 1907, £327; and 1908, £689. The net profit on fittings is £115 less than the previous year. Coal cost £1706 more, owing to the increase of nearly 2s. 6d. per ton in the price, and also to the fact that 608 tons more were carbonized. The very good results of last year with regard to make of gas per ton of coal could not be repeated, because of the inferior quality of some of the coal supplied, and also the fact that wet stock coal had to be used for a month owing to the difficulty of obtaining supplies from the pits. One contract was eventually cancelled after a great deal of trouble. Maintenance of works and plant cost £1657, against £1856, though a great deal of work was done. The total expenditure was £17,194, against £16,023; and as coal alone cost £1706 more, the reduction in other items of expenditure amounted to £535. The net income for the year amounted to £21,576, against £20,285, or £1291 more. The expenditure on new installations of prepayment meters was only £112, against £393 in the previous year, though 127 houses were fitted up, against 146; the reason being that a number of non-paying consumers were cut off and their meters, stoves, &c., used for new consumers, with the result that a considerable increase in the consumption has been secured at a very low cost. In this connection it is interesting to note the following figures of the average consumption of gas per consumer by slot-meter users for the last three years: 1906, 8344 cubic feet; 1907, 8502 cubic feet; 1908, 8996 cubic feet.

HUNSTANTON GAS SUPPLY.

At the last Meeting of the Hunstanton Urban District Council, the annual report of Messrs. Stevenson and Burstal, the Consulting Engineers to the Council, was presented. In the course of it they stated that the total quantity of gas sold during the year ending the 31st of March was 14,551,300 cubic feet—an increase of 8·91 per cent. on the consumption the previous year, which was nearly 16 per cent. more than the previous twelve months. This showed that the undertaking was progressive, and that the supply of gas to the inhabitants was satisfactory. After making due allowance for the quantity of gas used on the works and in the public clock, which was not paid for, the unaccounted-for gas amounted to 7·17 per cent.; being the smallest proportion yet returned. The total quantity of gas lost was practically the same as the previous year; but as the make was more, the percentage was slightly less. There was an improvement in the proportion of coke sold. It was rather less than 50 per cent. of the make, taking 13 cwt. of coke to the ton of coal, against 44 per cent. in the previous year. The quantity of gas made per ton of coal was an improvement upon that of the previous year; being 10,455 cubic feet, against 10,368 cubic feet. It would have been higher than this had it not been for the fact that in the first five months of the year the coal was not apparently quite of the same class as in the latter part. During the last seven months, however, the quantity of gas made per ton of coal had been rather more than 10,500 cubic feet. On the whole, therefore, Messrs. Stevenson and Burstal considered that there had been improvement in the working of the undertaking; and they presumed there had also been improvement in the profits.

Reduction in Price at Llandudno.—At the last meeting of the Llandudno Urban District Council, it was decided, on the recommendation of the Gas Committee, to reduce the price of gas by 2d. per 1000 cubic feet; bringing it down to 3s. 2d. It is estimated that this alteration will cause a reduction of £486 in the profits of the undertaking.

Sales of Shares.—Mr. W. R. Tompsett recently sold by auction some parcels of stock of the Tonbridge Gas Company. "A" stock, on which 12½ per cent. is paid, realized £61 10s. and £63 for £25 of stock, £96 for £40, and £120 and £121 for £50. "B" stock, on which 9½ per cent. is paid, fetched £47 10s. and £48 for £25, £74 10s. for £40, and £91 and £93 for £50. There was only one lot (£47 10s.) of "C" stock, on which 5 per cent. is paid, and it was sold for £51 10s. For £25 of "D" stock, which carries 9½ per cent., £50 and £51 10s. were paid, and £96, £96 10s., and £97 for £50. Last Tuesday, Mr. E. G. Lalonde sold £6000 of new 5 per cent. ordinary stock of the Weston-super-Mare Gas Company; being part of £36,000 the Company are authorized to raise. It was offered in £50 lots, which were sold at prices ranging from £57 10s. to £57 17s. each. At Stamford, a few days ago, Messrs. Richardson sold £3000 of 5 per cent. preference stock of the Stamford and St. Martin's (Stamford Baron) Gas Company, at prices ranging from £106 to £110 per £100—the average being £106 6s. 4d.

INSPECTION OF GAS LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspectors' Reports.

In the two preceding issues of the "JOURNAL," the last annual report of the Chief Inspector under the Alkali Works Act, 1906 (Mr. R. Forbes Carpenter), has been dealt with. To-day we give another section of it, as well as some extracts from the reports of the District Inspectors.

The first district is Ireland, which is under the supervision of Mr. E. G. Ballard. There are 38 sulphate of ammonia works in the district; and, as a rule, they are carefully conducted. Only once had Mr. Ballard occasion to call attention to an escape of sulphuretted hydrogen from the purifier; and the manager promised that it should not occur again. The dangerous nature of the saturator gases has been well impressed upon the managers; but, so far, with one exception, no attempt has been made to fix the cyanogen compounds so as to prevent them entering the saturator. Products equivalent to 2901 tons of sulphate of ammonia were made during the year. The proportion of total liquor distilled by the continuous and intermittent systems of distillation was 97·9 and 2·1 per cent. respectively. The proportion of sulphuretted hydrogen treated by various methods, in terms of sulphate made and percentage of total make, was as follows: By oxide purification, 90·8; precipitated by metallic salts, 8·9; burnt, 0·3. The larger number of works where tar is heated are works for the manufacture of roofing felt; and they are well conducted. At those where tar is distilled, provision is made for dealing with the noxious gases evolved at the worm end of the still, either by burning or by absorption of the sulphuretted hydrogen in oxide of iron. Small purifiers are preferred; the oxide being changed for each batch of tar distilled. Purifiers of the heap type are suitable for the purpose.

In the North of England district, which is under the supervision of Mr. John W. Young, there are 68 works producing sulphate of ammonia. The output from gas-works shows an increase of 4 per cent., and from coke-oven works of 15 per cent., compared with the figures of a year ago. The total quantity of gas liquor distilled, in terms of tons of sulphate of ammonia, was 33,092; and 99·4 per cent. was dealt with by the continuous method. One works ceased last year to use the Claus process for the destruction of the foul gases evolved from the saturators. The plant fell into decay; and, in preference to rebuilding, it was decided to revert to oxide purifiers. At the other works using it, results were, on the whole, good; and the average amount of total acidity in the gases leaving the limestone towers was 0·75 grain of sulphur trioxide per cubic foot. Regarding the quality as well as the quantity of sulphur produced, however, there was great discrepancy, and Mr. Young is convinced that the efficiency on this score is in direct proportion to the skill and attention bestowed on it. He sees products varying from sulphur which has over 99·8 per cent. of purity, and is good enough for all commercial purposes, down to green mixtures, loaded with cyanogen compounds and other extraneous bodies, and practically unsaleable. Approximately, he estimates the gross revenue to be obtained at £20 per 100 tons of sulphate of ammonia made; but he says few attain this rate.

In the district that comprises Cheshire, North Wales, and part of Lancashire, which, with Ireland, is under the supervision of Mr. E. G. Ballard, there are three plants for the concentration of gas liquor for shipment in the district. These and other works registered as gas liquor works were carefully conducted throughout the year. In only one instance was there a trace of sulphuretted hydrogen escaping into the atmosphere; and this was immediately rectified. There were 23 sulphate and muriate of ammonia works registered during the year. No serious infractions occurred; and any slight escape pointed out was immediately rectified. No outside complaints arose in connection with works for the manufacture of sulphate of ammonia. In two instances during the year steps were taken by manufacturers for preventing cyanogen compounds entering the saturators, which otherwise become a serious source of danger to the workmen employed. Mr. Ballard expressed the hope that during the current year others would follow on the same lines, and do something to arrest the poisonous hydrocyanic acid in the saturator gases, to the advantage of both employer and employed. In towns where the bacterial treatment of sewage is adopted, the presence of cyanogen compounds in the sewage is prejudicial to the process; and it becomes desirable that effluents containing large amounts of cyanogen compounds should receive some preliminary treatment before entering the sewers. Widnes and Runcorn are under Mr. Ballard; and he reports that all the sulphate and muriate of ammonia works were kept in good order. No trouble arose from the escape of sulphuretted hydrogen into the atmosphere; this noxious gas being efficiently dealt with in all cases.

There are 13 works producing liquor ammonia, and 46 producing sulphate or muriate of ammonia—mostly the former—in the district supervised by Mr. Herbert Porter, which comprises North and East Lancashire and part of Yorkshire. The total quantity of liquor distilled was equivalent to 23,873 tons of sulphate of ammonia; 94·8 per cent. being treated by the continuous process. The methods of dealing with foul gases were their conveyance to vitriol chambers, their absorption by lime or oxide of iron, or their treatment by "other methods." There was a decrease under the last heading in the past year, due to the adoption of the Claus plant in connection with coke-oven works. At one works where very successful plant of this kind has been erected and worked with great care, fully 2·5 tons of excellent sulphur was produced per 100 tons of sulphate of ammonia manufactured; and as these works were large, the sulphur represents a considerable additional profit. The important factors in the construction of this kind of plant are the internal area of the kiln and a very carefully regulated air supply. From careful observations and comparisons of different kilns, Mr. Porter says the best working area appears to be 4 square feet per ton of sulphate produced in 24 hours, and the depth of packing not more than 3 feet, in three grades of lump iron ore. The kiln should be placed on top of the first sulphur-depositing chamber, and not at the side connected with a short trunk, as is commonly the case, as this trunk very soon becomes defective at the point of junction with the circular kiln. There are 24 tar-distilling works in Mr. Porter's district; but no complaints of nuisance were received.

Four new sulphate of ammonia and gas-liquor works were added last year to the number in the East Midland district, which is supervised by Mr. E. Morley Fletcher. They were all plants in connection with coke-oven works; three of them making sulphate of ammonia, and the fourth a concentrated ammoniacal liquor. There was considerable increase in the number of coke-ovens during the year; the output of sulphate of ammonia from this class of works having increased 41 per cent. The total quantity of liquor distilled was equivalent to 24,118 tons of sulphate; and 98·8 per cent. of it was treated by continuous processes.

The manufacture of ammonium sulphate, chloride, and carbonate, and the concentration of gas liquor are now carried on in 110 works in the South Midland district, in charge of Mr. Edward Jackson. The plant at one works previously registered for sulphate of ammonia manufacture has been stopped; all the liquor now being dealt with at a larger works of the same gas company. Six additional works were registered; but only one of them is an ordinary gas-works sulphate plant, and ample condensers, with oxide of iron purifier, were attached. One of the new works is a large power gas sulphate of ammonia apparatus of the usual type for these works. At the remaining four new works, the ammonia plants are all in connection with coke-ovens. In one case, the ammoniacal liquor is only concentrated for use in ammonia-soda works. At the other three works, the ordinary sulphate plants were erected. In each of these works, the saturator gases are returned to the condensers and scrubbers of the gas plant. What remains, being thus mixed with the gases used for heating the ovens and boilers, is subsequently burnt. The increase in the total acidity of the flue or chimney gases by the adoption of this method of disposing of the noxious gases was not found, from numerous tests, to be great. The works were therefore passed for registration without any change of method being necessary. In no instance was any trace of sulphuretted hydrogen discovered in the flue or chimney gases. The average of the tests taken in the three works was as follows: Total acidity of chimney gases 1·01 grains as sulphur trioxide per cubic foot; increase with sulphate of ammonia plant working, 0·19 grain per cubic foot. There are already registered in the district 14 coke-oven works with recovery of products plants attached—viz., two in North Staffordshire, four in North Derbyshire, and eight in South Yorkshire. The number of ovens in operation at the different works varies considerably. At present the largest plant is one with 100 ovens, into which upwards of 500 tons of slack are charged every 24 hours.

Mr. Jackson says the disposal of spent ammoniacal liquor is an increasing trouble in many of the Midland works. At one works where there was very considerable difficulty, neutralizing the alkaline liquor proved sufficient to satisfy the requirements of the river authorities. In this case sulphurous acid from the combustion of the sulphuretted hydrogen in the saturator gases is used. Where, however, the outlet for the liquors is the sewers of the local authorities, and the sewage is treated by bacterial means, objection is being taken to its reception. On this account, at two works plant has been erected for the removal of the sulphocyanides by the Radcliffe process.* In the difficulty with the bacteria beds, when these spent liquors are mixed with the sewage to be treated, proportion, as was to be expected, is very important. In this connection, Mr. Jackson says the valuable work done by Dr. Percy F. Frandland and Mr. Harry Silvester with the Oldbury sewage would well repay careful study by all interested in this question. The paper embodying this protracted work was read before the Birmingham and Midland Section of the Society of Chemical Industry early last year, and was noticed in our columns at the time.†

The distillation of tar is now carried on at 28 works in Mr. Jackson's district. Two new works of this class were registered last year; and at one of them, where the tar is now distilled, it is produced in a large power-gas plant. At the other new works crude gas tar is boiled for "pipe dipping." It is usual at such works to employ specially prepared tar for this operation, such as Dr. Angus Smith's composition. There is not much change to report in the tar-distilling works in the district. The arrangements for dealing with the offensive gases were satisfactorily carried out. In one case, however, where works of considerable size are situated in a populous district, complaints were received from time to time from those residing in the neighbourhood. A careful investigation as to the cause of these complaints pointed almost always to vapours given off from storage-tanks, creosote, &c., and not to the offensive gases generated during the process of manufacture. Mr. Jackson says the proprietors have been willing to adopt suggestions whenever made to them with a view to minimize, as far as practicable, offence from the source referred to above.

In the district embracing the South-West of England and South Wales, which is under the supervision of Dr. Alfred C. Fryer, there are 85 works registered where the manufacture of sulphate and muriate of ammonia is carried on. Two new sulphate of ammonia plants were registered during the year; and they are both provided with good condensers and oxide of iron purifiers. The method of absorbing the sulphuretted hydrogen in oxide of iron has been discontinued in one works; the foul gases being now passed into the hydraulic main of the gas-works to which the works are an adjunct. Some complaints were received in the early part of the year respecting noxious vapours escaping from the sulphate of ammonia plant at another works in the district. On investigation it was found that the plant was not always in operation when the smells were complained of; and the objectionable fumes were evolved from burning heaps of town refuse in the neighbourhood of the gas-works. Complaints continue to be made against the Bournemouth Gas Company's works at Branksome; but as yet no satisfactory explanation can be given. Dr. Fryer says the complaints are frequently made when the sulphate of ammonia plant is not in operation; and consequently he believes that they do not emanate from this source.

Early in the year, the oxide of iron purifier at one works was found to be in a foul condition, and sulphuretted hydrogen was escaping into the atmosphere; the manager having run out of fresh oxide. Having

* See "JOURNAL," Vol. XCVI., p. 22. † *Ibid.*, Vol. XCVIII., p. 92.

expressed great regret for allowing the plant to be worked under such a condition, it was decided to pass the matter over with a serious reprimand.

The question of the use of burnt oxide in purifiers is of such practical interest that any figures relating to the subject are of value. Some experiments have been made at the works belonging to the Powell Duffryn Steam Coal Company at Bargoed, and Mr. W. Greaves, F.I.C., sent to Dr. Fryer the following details :—

First saturation gave 9·92 per cent. of free sulphur.
Second saturation gave 17·25 per cent. of free sulphur—*i.e.*, 7·33 per cent. additional sulphur.
Third saturation gave 20·57 per cent. of free sulphur—*i.e.* 3·32 per cent. additional sulphur.
Fourth saturation gave 28·22 per cent. of free sulphur—*i.e.*, 4·55 per cent. additional sulphur.

In order to ascertain if it were only a portion of the iron in the burnt oxide, combined with various acids forming soluble salts, which became active when those salts were decomposed with the ammonia contained in the gas, the soluble iron salts were washed out of the burnt oxide. The remaining neutral iron oxide was then subjected to a current of sulphuretted hydrogen, and it was found that it only absorbed a trace of it even on the addition of ammonia. Mr. Greaves considers that if they had allowed it to be in contact with the mixture of ammonia and sulphuretted hydrogen for some time, the burnt oxide would have become "active."

Dr. Fryer says it is evident that before burnt oxide is largely made use of, many points must be studied. Preparation of the burnt oxide before it is placed in the purifiers will require technical attention, as well as careful experiment to determine the most favourable position for placing it in a series of purifiers. The causes which make it "active" in absorbing the sulphuretted hydrogen and the problem of the variations of its activity must also be seriously considered.

The distillation of tar is carried on at 12 works in Dr. Fryer's district, and provision exists at all of them for dealing with the permanent noxious gases evolved at the worm-end; these being either conveyed to a fire for destruction or absorbed in oxide of iron purifiers. No complaint respecting works of this class was received during the past twelve months.

In the eastern and south-eastern counties, which are under the supervision of Mr. F. Napier Sutton, 94 works have been registered for the manufacture of sulphate of ammonia, and two for the concentration of gas liquor. At five of the former works, ammoniacal liquor is treated otherwise than for sulphate manufacture; making a total of 101 operations requiring inspection. The total quantity of ammoniacal compounds manufactured in the district showed an increase of 3573 tons on the production of the year 1906.

The products manufactured from gas liquor consist chiefly of sulphate of ammonia, but include carbonate and nitrate, liquid (concentrated and refined), and anhydrous ammonia. All products have been obtained from the distillation of coal, with the exception of a few hundred tons derived from the carbonization of bone in the manufacture of animal charcoal. The gas-works belonging to companies and local authorities furnished 87·2 per cent. of the products, and the balance of 12·8 per cent. was made in the works of private firms. The total quantity of liquor distilled was equivalent to 52,443 tons of sulphate; and the proportion treated by the continuous process was 99·3 per cent. Though there was an apparent reduction from 65·3 to 60 per cent. in the proportion of saturator gases used for acid manufacture, the actual quantity of sulphuretted hydrogen gas utilized for this purpose was almost identical with that of the previous year. Almost the whole of the acid required for this large output of sulphate of ammonia was derived from the sulphur removed in the purification of coal gas. Mr. Sutton says the abolition of the sulphur restrictions in the Metropolitan area has led to an enormous increase in the quantity of spent oxide available for acid making; but the full effect of the change has not yet been felt. A considerable increase is shown in the proportion of gases treated by the Claus sulphur-recovery process, which is in use at ten of the works in the district.

An interesting departure from the usual type of sulphur-depositing chamber has been made at one works. One of the great objections to the brick depositing chambers hitherto invariably constructed has been the rapid destruction of the brickwork at the hot end of the chamber by expansion due to the action of the hot acid gases on the bricks and cementing material. Mr. Alfred E. Fletcher, the late Chief Inspector, expressed the view twenty years ago that a lead chamber similar to that used for sulphuric acid manufacture might be an improvement on existing brick chambers. Mr. Sutton has long felt that this view was sound, and has for years advocated a trial of this form of chamber. But it is only recently that any engineer has had the courage to try the experiment. The brick chambers next to the Claus kiln at the works above mentioned having fallen into disrepair, they were replaced in June last year by a single lead chamber, supported in the usual manner by a timber framework. The chamber is 20 feet long by 13 feet wide, is 10 to 11 feet high, and is made of 7 lb. sheet lead. There are two clearing-doors at the side, and the top is provided with three manholes for ventilation when clearing the chamber of sulphur. The floor is concrete covered with sheet lead, and burned to the sides; but the leadwork is protected by an inner floor made of old sulphate store floorboards, and similar woodwork is carried 4 feet up the sides. The hot sulphur vapours pass from the kiln to the chamber by an 18-inch cast-iron pipe, 2 ft. 6 in. long; the collar being packed with asbestos and "dressed" with lead. The outlet is a similar cast-iron pipe, and leads to the usual circulating brick chambers, where the fine flowers of sulphur are arrested while the waste gases pass to the catch limestone scrubber and purifier. The chamber has now been in use some months, and is apparently a success in every way.

At two works in the district the Radcliffe process, already referred to, is used for treating the spent liquors from the ammonia stills for the removal of the sulphocyanides. In each case it has been found advisable to pass the whole of the saturator gases into the special furnace, for the conversion of the sulphur ingredients into sulphur dioxide. The acid gas is partly absorbed in the wash-tower, and finally in the limestone scrubber; the acid bisulphite liquor passing, together with a regulated supply of copper sulphate, to the mixing-tanks to which the spent liquors flow. After settlement of the cuprous sulphocyanide, the waste liquors are clear and almost colourless; the characteristic brown-red of the original spent liquors having entirely disappeared. These two works are now included with those at which the combustion neutralization method of disposal is used; and the proportion of gas thus treated is 7·8 per cent. of the total.

Two tar-distilling works were added to the register in the past year; bringing the total number up to 22. The new works both deal exclusively with carburetted water-gas tar. At one of them, three stills are worked under vacuum by steam exhaust; the vapour being condensed in a tubular water condenser, and the permanent gases absorbed in oxide of iron. In the second works one still only is employed, from which the gas is trapped at the worm-end and passed to an oxide purifier. At two works the method for disposing of the gases has been altered from combustion under the boiler fires to absorption in lime purifiers; these alterations being an improvement under the special circumstances existing. Mr. Sutton says that, in general, the means employed for preventing the discharge of noxious gases in this industry have been carefully exercised. The total distillation plant employed in the district consists of 116 intermittent stills and four of Leonard's patent continuous stills.

SUGGESTED FIRE-CLAY MANUFACTURE CLASSES.

Interesting Interviews.

With a view to eliciting opinions as to the desirability of establishing classes in fire-clay manufacture, in order to improve the knowledge of the employees engaged in the industry, a representative of the "County Express for Worcestershire and Staffordshire" has been interviewing some gentlemen whose position in the fire-clay world enables them to speak with authority on the subject. The result is embodied in the following article, which has since appeared in the paper named.

A suggestion was made at a recent meeting of the Stourbridge Higher Education Committee, arising from hints given, we believe, by Professor Turner, of the Birmingham University, at the last prize-giving of the classes under the Committee, as to the advisability of organizing a class specially connected with the fire-clay industry. The subject was sympathetically received by the Committee; but there seemed to be entertained the view that, if anything of a tangible nature was to result, the masters in the trade must come forward and assist the proposal by their influence with their workmen, and also financially, either in the way of paying fees or in the provision of prizes. In making his inquiries, our representative's attention was directed to a paper read before the Institution of Gas Engineers, in London, last month, by Mr. F. J. Bywater, of Birmingham, on "Refractory Material," in the course of which he said: "Despite the fact that knowledge of the raw materials is, or should be, greater than it was twenty years ago, and that new and extensive sources of highly refractory material have been opened up during this period, it is a matter of very grave doubt whether, on the whole, the quality of fire-brick and retort material has generally improved. . . . In some cases, clay samples and bricks are submitted to analytical chemists from time to time; but the number of works possessing a scientific staff is exceedingly few."

Mr. C. W. Thomas, of the firm of Messrs. E. J. & J. Pearson, stated, in reply to an inquiry from our representative as to his views with regard to the establishment of a class in fire-clay manufacture, that if a class were carried out on lines which would have the effect of improving the product, then it would be a distinct advantage. So far as he knew, there had never been any attempt to give instruction other than the employees picked up in the course of their daily occupation. "There is, no doubt," he said, "a better understanding of the nature and qualities of fire-clays and their peculiar properties. . . . If a man knows all about the material he is working with, he is likely to do better than if he has no knowledge of it. Clay is a very complex material, and subject to laws which, apparently at any rate, are different from a great many other materials used in manufacture." Mr. Thomas remarked that personally he thought it would be a good thing if a suitable course of training could be provided. Most of the knowledge of the district was rule-of-thumb, which, though good in its way, did not always enable a man to put right what he found wrong. A great deal depended in clay products on the treatment they got in the kilns in burning. "In this connection," Mr. Thomas said, "a good many other industries are in advance of us, because they take the trouble to train the men who have charge of the burning. A trained burner knows what he can do with the material, and how to make the best of his fuel; and this carries with it ultimate advantage to the man who has to use the material. Most other trades have found the necessity of increased technical knowledge on the part of their workpeople; and I do not think the fire-brick trade is likely to remain an exception. So far, however, there are no classes at all."

Asked whether he thought a class or classes in fire-clay manufacture would be attractive, Mr. Thomas remarked that he could not say what was the feeling among the employees of other firms; but speaking of his own works, there were a considerable number who had gone, and were going, to technical schools with the idea of improving their capacity for modelling. Up to the present, they had not attempted to go beyond this. The demands made on fire-brick for various purposes in these days were much higher than they were formerly. The temperatures of most manufacturing processes had risen considerably. Consequently the brick had to stand a good deal more punishment; and manufacturers were beginning to look round for better grades of brick. A good knowledge of clays was absolutely essential to enable anyone to meet the varied demands made in different processes. Mr. Thomas's opinion was sought with regard to the Continent; and he stated that abroad, on the Continent and in America, they had done very much more in the direction of technical knowledge in fire-clays than we had in England. For a considerable time he had been impressed with the necessity for something being done; and he had done a certain amount of work to this end. Referring to the quotation given above from Mr. Bywater's paper, Mr. Thomas said that a great many

people were waking up to the fact that they could do with a good deal better fire-brick than they were getting in many industries other than gas. Mr. Thomas pointed out a Deville furnace, which the firm had adopted in the works at Dalph for testing the refractoriness of clay; and he further stated that they did their own analyses, and made their own examinations of the clays. In conclusion, Mr. Thomas expressed himself much in favour of the establishment of classes in fire-clay manufacture.

Mr. E. P. Page, also of Messrs. E. J. & J. Pearson, strongly advocated the establishment of a class in fire-clay manufacture. Mr. Page has devoted himself for years to this subject; and the firm have spent considerable sums in assisting him in his investigations. Mr. Page drew attention to the Deville furnace referred to by Mr. Thomas, and also to the latest addition to the works, which is a gas-fired kiln; and he informed our representative that there is only one other such kiln in the world. The kiln had only been in operation a short time; but the results were most satisfactory. In his paper, Mr. Bywater said that good quality British fire-clay material would withstand moderately high temperatures (2500° Fahr.) very fairly; but it was stated by Mr. Thomas and Mr. Page that the average quality of Stourbridge clay is equal to 3220° Fahr. Mr. Page added that the material is usually fired in the ordinary kilns at about 2400° Fahr., without the material being affected.

On the question of the establishment of classes, Mr. Page expressed the opinion that it was becoming increasingly essential that they should have skilled assistants in the works; they must not have stupidity. Training in the direction he advocated would teach a youth to be observant, and so make him a great deal more useful as a workman. Another advantage attaching to the training was that it would enable the brighter ones to fit themselves for managerships—providing, of course, that their other capacities were equal to it. But, apart from this, the general advantage to the workman, and the employer too, would be great. . . . There were many technical terms used by the better class of clay workers, which would be as so much Dutch to the average man, without some sort of special education. Perhaps the best feature attaching to a class was that it generally brought together the brightest of the intellects among the youths connected with an industry. Again, there was a literature growing up with the clay industries, which was only to be understood properly by those possessing a certain amount of technical scientific education. With a good teacher of such a class, the students were brought immediately in touch with all the latest developments in manufacture, and with knowledge of materials which otherwise they could not get.

Mr. Page, in conclusion, remarked that the subject was one of profound importance, not only to Stourbridge, but to the surrounding districts of Brierley Hill, Lye, Cradley, Dudley, and Rowley; and he hoped the manufacturers and public generally would interest themselves in the movement.

TAR MACADAM FOR STREETS AND ROADS.

At the Meeting of the Royal Sanitary Institute at Cardiff last week, Mr. G. S. Brodie, the Borough Surveyor of Blackpool, read a paper on "The Best Method of Mixing and Laying Tar Macadam for Streets and Main Roads."

After a few introductory remarks, the author said that until the evolution of an ideal road surface material, which he by no means despaired of, took place, tar macadam was, with certain limitations, one of the few materials at present in use which most nearly fulfilled the requirements of rational road making. His practice was to underdrain where necessary the site of the proposed tar macadam road with open-jointed 3-inch tile drains connected to the surface-water gullies. The underbed was then formed to the proper levels and contour by means of a transverse sectional gauge, and was thoroughly rolled and consolidated under a steam-roller—any inequalities being made up with sand filling. On the under-bed so prepared the foundation proper was then laid. It consisted of rubble (grit, limestone, or granite, or even good hard clinker, as might be most economical), 9 to 12 inches in length, 3 to 6 inches in width, and 7 to 9 inches in depth, laid on edge lengthwise across the road. The interstices were filled up with similar stone broken to 2½ to 3½ inch gauge; and the whole foundation was then rolled by a 10-ton steam road-roller to the correct cross-sectional gauge or template above referred to, until the surface of the foundation presented the appearance of a well-rolled macadam road. On this foundation, the tar macadam was laid.

Mr. Brodie went on to say that various materials were used for forming tar macadam; but he had found the most uniform satisfaction to follow from the use of a suitable grey or light-coloured limestone, which must be broken to three sizes—viz., 2½ and 1½ inches, and ⅜ to ½ inch—and all dust, dirt, and smaller material most carefully screened out of it. His matrix consisted of suitable hard pitch, properly tempered by impure carbolic acid, commonly known in the trade as creosote oil. They were mixed in the proportion of about 1 gallon of oil to 40 lbs. of pitch. The stones were properly dried, and the various sizes were then separately covered while boiling hot with the asphalt composition, to which a small quantity of dry sand and lime was added in the buckets after it left the boiler, and stirred up by hand. The asphalt macadam should be laid on the foundation in favourable atmospheric conditions. The prepared material should be spread in successive layers—the largest gauge in the bottom, the 1½-inch gauge above the largest size stone, and the finest gauge on the top. An allowance should be made of from 20 to 25 per cent. more depth than the ultimate depth aimed at after rolling. For a finished depth of 5 inches of tar macadam, at least 6 inches in depth should be spread. Also, the thickness of the intermediate and top layers should not vary, whatever the thickness aimed at; the variation being all in the bottom layer of large-gauge stones. All the layers having been put on, rolling with a steam road-roller of from 10 to 15 tons, on a wheel base of 6 feet, should be started at once, before the coating had received any moisture or dust; and it should be continued until the rollers had passed at least twenty times over the entire surface of the road. No traffic should be allowed on the road until 48 hours had elapsed after the rolling was completed, so as to give the tar macadam sufficient time to harden.

The author concluded by saying that the use of tar macadam for forming the surface of roads and streets must be confined within the following limitations: It was not suitable for gradients steeper than 1 in 24, by reason of its slipperiness after wearing smooth; nor was it suitable for heavy traffic. In any road, whether a street or a main road, where the traffic exceeded an average of more than 100 tons per yard of width of roadway per diem, tar macadam would be found to be more expensive to maintain than wood paving or even rock-asphalt. On the other hand, for purely residential streets, whether front or back, where local traffic only, or through traffic limited to the extent indicated above, was expected, a tar macadam road surface would give unqualified satisfaction as being impervious to moisture, and therefore always clean and free from dust and slops, practically noiseless, and the most economical roadway at present known, considering its advantages.

COAL CONSUMERS' DEFENCE LEAGUE.

The League and the Coal Mines (Eight Hours) Bill.

Some erroneous statements having lately been made with regard to the constitution and objects of the above-named League, the Organizing Secretary (Mr. G. E. Raine) has issued an explanatory circular which furnishes the following particulars.

The League is strictly non-political, and represents commerce and the large consumers of coal, as well as the interests of the small consumers, in opposition to the Coal Mines (Eight Hours) Bill. The President is the Right Hon. Lord Newton, the Chairman of the Executive Committee is Mr. F. S. Watts, and among the Vice-Presidents are Mr. W. Doig Gibb, the Past-President of the Institution of Gas Engineers; Mr. H. E. Jones, the Chairman of the Cas Companies' Protection Association; and Sir George Livesey, the President of the London Waterside Manufacturers' Association.

Possibly supporters of the League are actuated by one or other of two motives, and in some cases probably by both. It is believed that any legislative interference with the hours of miners, such as the Government Bill proposes, must result in a decrease of output and an increase in the cost of coal. It is felt that the real promoters of the Bill (the Miners' Federation) are aiming at nothing less than this. That is one motive. The other, which undoubtedly actuates some of the members, is the conviction that the Bill is merely a pioneer measure to establish a precedent for parliamentary interference with adult labour. After the speech delivered by Mr. Churchill on the 6th inst., on the occasion of the resumed debate on the second reading of the Bill (*ante*, p. 120), these apprehensions have been intensified. It is not the League's policy, however, to inquire of the members which of these motives is the influencing force.

It was thought desirable to intervene at bye-elections and oppose parliamentary candidates who were pledged to support the measure. The Executive Committee propose to persist in this course, whatever the politics of the particular candidate may be. It is felt by the Committee that this course, which was decided upon with reluctance, has been abundantly justified, not only in the educational work which it has been found possible to achieve in the country in this way, but also in the effect which this intervention has had upon the sponsors of the Bill. In addition to this, however, a systematic distribution of popular literature upon the subject has been carried on, and public meetings on strictly non-party platforms are being held to prove that the collier can only receive preferential treatment at the public expense.

It is stated that the plan of campaign hitherto obtaining will be developed, and on an infinitely larger scale. Branches of the League are in process of formation in several of the large centres, and it is hoped supporters will communicate with the head office, and assist in extending the effectiveness of the League's work. It is possible that the last fight against the Bill will be in the Upper House; and, bearing this in mind, the League propose in the autumn to conduct a strenuous campaign throughout the country, with a view to still further enlisting the support of the general public. The experience gained up to date proves that the cause which the League is advancing is readily accepted by the people as soon as it is explained.

Parties interested in this question are earnestly invited to associate themselves with the efforts of the League, and the Executive Committee would be glad if they would communicate with the Organizing Secretary, at Sanctuary House, Tothill Street, Westminster, S.W. It is scarcely necessary to add that a large fund is required to carry on the League's work throughout the country.

Public Lighting of New York.—On the 1st of January last, there were 165 open-flame and 43,466 incandescent gas-burners in use in New York; and they were distributed in the various districts as follows, the first figures being those for the open-flame burners: Manhattan, 75, 15,425; the Bronx, 88, 5992; Brooklyn, 2, 17,739; Queens, 4310. The price charged for the open-flame burners is $5 per annum; for the incandescents, $12 in Manhattan and the Bronx, $13·32 in Brooklyn, and $13·98 in Queens. In addition to the gas-lamps, there are 14,594 electric arc and 4731 electric incandescent lamps, 4365 naphtha lamps (all but 12 of which are incandescent), and 185 free lamps; making a total of 67,506.

Salaries of the Birmingham Gas Engineering Staff.—In a report to be submitted at next Tuesday's meeting of the Birmingham City Council, the Gas Committee state that they have carefully reviewed the salaries of the engineering staff; and they now recommend the following increases, as from the 1st inst.: Mr. Frederick J. Bywater, Engineer in Charge, Saltley Works, from £375 to £425 per annum; Mr. Walter Chaney, Engineer in Charge, Nechells and the Adderley Street Works, from £525 to £625 per annum; Mr. John Foster, Engineer in Charge, Windsor Street Works, from £600 to £650 per annum. They also recommend that the salary of Mr. W. B. Davidson, M.A., Ph.D., Chief Chemist, be increased as from the 1st inst. from £375 to £425 per annum.

METROPOLITAN WATER BOARD.

The Estimates for 1908-9—Expected Deficit.

At the Meeting of the Metropolitan Water Board last Friday, the report of the Finance Committee, dealing with the annual estimates, was submitted.

Lord WELBY, in moving the reception of the report, said that when he made his financial statement for the year 1906-7, the Finance Committee estimated a surplus of something like £33,000. When the Auditor's report was presented, the surplus was rather less—being £26,504. He therefore estimated an income for the year 1907-8 of £2,906,000. The estimated expenditure was £2,896,000. The excess of income over expenditure for 1907-8 was £10,000; but since that time a supplementary estimate had been submitted amounting to £10,000, with the result that the £2,906,000 and the £2,896,000 were exactly balanced. Taking the four years altogether, the Board were able to put aside the surplus over expenditure towards the reduction of the debt, which was £47,000,000. The estimates for the year 1908-9 were in a peculiar position, because the Charges Act coming into operation had made so many changes and modifications that the Finance Committee were unable to get any trustworthy estimate of the income. The expenditure was reckoned at £2,930,000. He was, however, glad to report that the expenditure of the various Committees showed a net decrease of £25,000. On the other hand, he was sorry that the estimates of the Finance Committee showed an increased expenditure of no less than £49,000, a net increase of £24,000. A considerable amount of expenditure was involved through the electrification of tramways by the London County Council, because the Board had to divert mains, &c. In consequence of this, they had to postpone certain works of their own which would otherwise have been undertaken. He was sorry there would be a decrease in the water income; but, owing to the Charges Act, they contemplated very considerable loss. They could not escape from the fact that the estimates for the year 1908-9 would end in a deficit.

Sir R. MELVILL BEACHCROFT said he was surprised Lord Welby had not dwelt further on the supplementary estimate. He was conscious that the receipts were less than they should be. The time had come when the Board should know where they were. They should know what were the prospective chances of meeting their liabilities. Fifteen years hence they would have to deal with their sinking fund. When this came into operation, they must provide not £83,000, but £140,000 a year, which was a very disagreeable thing to contemplate. They were spending money freely. They could only prevent going on the rates by carefully watching expenditure. For the past sixteen years the Water Companies spent, on an average, £535,000 per annum on capital account. For nearly four years the Board had spent about £350,000 per annum on capital account, and were now face to face with an expenditure of £1,500,000. He did not think things would be any better in October than they were at present. They were bound to recognize that the result of the year's working would be a loss which it might be necessary to charge upon the rates.

After some discussion, the estimates were passed.

THE WATER SUPPLY OF CARDIFF.

Before the Engineering Section of the Congress of the Royal Sanitary Institute, at Cardiff, last Wednesday, Mr. C. H. PRIESTLEY, M Inst.C.E., the City Water Engineer, read a paper on the "Cardiff Corporation Water-Works."

The author traced the history of the water supply from 1850 to the purchase of the undertaking of the old Water Company in 1879. He said that, following the purchase, the Water Committee took into consideration the whole question of supply, with a view to constructing such works as might adequately meet the ever increasing needs of the town and district, and instructed their Engineer to report generally upon all available sources within reasonable distance of Cardiff. A scheme was eventually decided upon, after much discussion, and on the advice of one of the most eminent water engineers in the kingdom, which was known as the Taff Fawr or Brecon Beacons scheme. To meet immediate requirements, a reservoir of over 300 million gallons capacity was constructed adjoining the existing Lisvane reservoir; this work having been authorized under the Company's Act of 1878.

The Taff Fawr scheme included the construction of three large reservoirs in the Taff Fawr Valley, over 30 miles from Cardiff; the highest of these being at the foot of the Brecon Beacons, and the lowest (yet to be constructed) being about 5 miles above the borough of Merthyr Tydfil, with a pipe-line or conduit running therefrom to the Llanishen reservoirs near Cardiff, and with balancing reservoirs as required *en route*. Parliamentary powers were obtained in 1884 for the impounding of the waters of the River Taff Fawr and the construction of these works. The watershed was divided into two areas, in order that the reservoirs might be built as required; the upper area containing 4000 acres and the lower area 6400 acres of gathering ground. The sites of the two reservoirs are on the old red sandstone formation, which is considered one of the best upon which to build water-tight dams. It is outside the area of the South Wales coalfield, and some distance from the mountain limestone near Cefn Coed. Two out of the series of three reservoirs have already been constructed on the upper area—the Beacons reservoir, which is at the foot of the Brecon Beacons, and has a capacity of 345 million gallons and a top-water level of 1340 feet above Ordnance datum, and the Cantreff reservoir, some 3 miles lower down, which has a capacity of 323 million gallons and a top-water level of 1073 feet above Ordnance datum. The conduit and balancing reservoirs were constructed at the same time as the Cantreff reservoir; the first portion of the supply from the Taff Fawr source being brought down to Cardiff in 1889, and the first section of the works included above completed in 1897. Compensation water has to be delivered into the river on account of the upper area to the extent of 3 million gallons per day.

It is now proposed to go on with the construction of the third reservoir of the series, which will have a capacity of over 900 million gallons and a top-water level of 844 feet above Ordnance datum. When this reservoir is constructed, a further quantity of $4\frac{3}{4}$ million gallons per day compensation water will have to be given to the river. The works already constructed in the Taff Fawr Valley were designed and carried out by Mr. J. A. B. Williams, M.Inst.C.E., who was Water Engineer to the Corporation up to 1895.

Simultaneously with the construction of the balancing reservoirs and the Taff Fawr conduit, new filter-beds and service reservoirs were built at the Heath ($1\frac{1}{2}$ miles from the City Hall), for the low-level service, and at Rhubina ($4\frac{1}{2}$ miles from the City Hall), where the last balancing reservoir for the high-level service is also constructed. It has been necessary since this date to considerably enlarge the works at both these places, and also to construct several subsiding service reservoirs and other works in different positions near the city.

The population at present supplied by the Corporation is estimated to be 222,000, of which over 30,000 are outside the city limits. The ordinary consumption of water averages about $6\frac{1}{2}$ million gallons per day, which in dry weather rises to a maximum of over $7\frac{1}{2}$ million gallons. For the year 1907, the actual average was 5,961,233 gallons per day, or 27·34 gallons per head on the then estimated population of 218,000. Out of this quantity, 11 gallons per head were sold by meter for trade and municipal purposes; thus leaving a domestic consumption of between 16 and 17 gallons per head. There are no extra charges in Cardiff or the district of supply for any domestic purpose in addition to the water-rent payable in accordance with the rating of the property, which for all houses of over £20 rateable value is 1s. in the pound. So there is no incentive to restrict the use of water; and private baths are very general in all classes of property, even cottage-houses of £20 rental and under being provided therewith—thus helping to promote cleanliness and sanitary conditions among the people. Since the water undertaking has been in the hands of the Corporation, a full and constant supply for domestic purposes has always been maintained, with the exception of a short period during the dry season of 1887; and the legitimate use of water for all purposes has been encouraged.

The water being very soft, having from 2° to 3° of hardness only, is suitable for all purposes, for both domestic and trade consumption; and the chemical and bacteriological examination always shows a high degree of purity.

In the course of the discussion which followed the reading of the paper,

Mr. BRODIE (Blackpool) asked if the water was filtered at all, or if there was any discoloration. The average consumption per head seemed very small; and consequently it would be interesting to know if Cardiff was entirely a water-closet town. If it was, the consumption was very creditable to the engineer in charge of the works.

Mr. LACEY wished to learn the type of filter used.

Mr. WALKER SMITH (Barrow) said he would like to know if the Cardiff Corporation had purchased the whole of the gathering-grounds. If not, it seemed to him that it would be better if they had, because it would enable them to prevent any serious source of pollution. His experience was that, where this was not done, there was a difficulty in preventing sewage entering the reservoirs. He was much impressed with the small consumption per head of the population, particularly having regard to the large proportion of baths. It certainly looked like excellent management; and he would like to know what the system was for detecting waste.

Mr. MARTIN (Westminster) asked if water for garden purposes was supplied by meter.

Mr. SMITH (Kettering) said that if the gathering-grounds had not been purchased by the Corporation, he would like to know if they had any parliamentary powers giving them authority to make bye-laws, so as to have effectual supervision.

Mr. WATERFALL (Bristol) inquired if the author could give any data as to the effect of the storage on the water.

Mr. HETHERINGTON (Yeovil) wished to know if the compensation which the Corporation had already paid was sufficient to prevent other claims coming in from bodies drawing water below the gathering-grounds.

Mr. PRIESTLEY, in reply, said that, so far as Mr. Brodie's question was concerned, for the water which came down to the Rhubina reservoir they had ordinary sand filters for the high-level service; that for the low-level service came into the Lisvane reservoir. There was no doubt in his mind that the subsiding reservoirs they had there were of great advantage to the water; and they found that the water delivered on the filter-beds at Heath Village was much better than when taken direct from the conduit into the Rhubina reservoir.

Mr. BRODIE: Does it affect the colour?

Mr. PRIESTLEY said that to a certain extent it did. The longer they could keep the peaty water in the subsiding reservoirs, the better was the colour of it. His experience was that it was better than filtration. Theirs was a peaty gathering ground. A considerable amount of peat was taken away; but still a proportion was left, and the peat and the acid from it had a very bad effect upon the pipes. The delivering capacity of the pipe-lines from the head works down to Cardiff was originally 12,000,000 gallons a day; but it had been reduced by incrustation by 25 per cent. in 25 years. His experience was in direct contradiction to that of Birmingham and Liverpool—viz., that after the filtration of the water, it had no effect upon the pipes. In his case, it certainly had. Cardiff was a water-closet town. They had Candy filters at Heath; but they were only used to a limited extent. They filtered 5,000,000 to 6,000,000 gallons a day through the ordinary sand filters, and about 750,000 gallons through the Candy filters. The Candy filters were put down with a view to economy, and had been a success; and the analysis had been equal to the analysis from the sand filters. The gathering-ground had not been purchased; but there was only one house on it. They carried out a system of waste-water prevention, which included house-to-house inspection. One thing which Cardiff had was a very low pressure. Their pressure on the low service did not rise to over 35 lbs. to the square inch in any part of the city. They could, of course, do with more; but the elevation of the filter-beds prevented it. This low pressure helped them considerably in keeping down the waste. They allowed water to be used with ordinary care

for garden purposes without extra charge; but anyone requiring a hose had to pay 10s. for the licence, and the user of an automatic sprinkler had to take his water by meter. They had had no claim for additional compensation; but during one dry season they paid a millowner £500. He could not say what the waste per head was, as it varied considerably. They had found great advantage in having waste-water meters, to show which district required inspection.

A vote of thanks was accorded the author.

NEW RESERVOIR FOR LEEDS.

A Big Undertaking.

The first sod in connection with the construction of the Leighton reservoir for the Leeds Corporation—with regard to the contract for which there has been so much discussion (*ante*, p. 57)—was cut last Tuesday by Mr. F. Ogden, the Chairman of the Water Committee.

The work is part of the Ure Valley water scheme, which has been under the consideration of the Council for some years; and the parliamentary powers obtained by the Corporation will enable them in the future, as need arises, to construct, in addition to the Leighton reservoir, a reservoir in the neighbouring valley of Colsterdale and two reservoirs in the valley of the Laver. It was originally intended that the Colsterdale reservoir should be the first to be constructed; but owing to faults that were discovered in the plans, and the alterations that became necessary, it was decided to postpone this part of the scheme until the Leighton reservoir was completed. The site of the Leighton reservoir is in a valley down which runs a tributary of the Ure, known as Pot Beck. In the same valley is situated the Roundhill reservoir, which is being constructed by the Harrogate Corporation; and both reservoirs will impound the waters of Pot Beck. When complete, the head-waters of the Leighton reservoir will wash the toe of the Harrogate reservoir bank. According to the parliamentary powers obtained, Harrogate will be allowed to take no more than 4 million gallons per day from the valley. The rest will flow into the Leighton reservoir; and with the aid of a supply from Spruce Gill Beck, Leeds will be able to take a daily supply of 7 million gallons. A huge embankment will be thrown across the valley; and the water will then flow in and form a lake with an area of 105 acres, and with a containing capacity of 1136 million gallons. The embankment will be the highest, and one of the longest, constructed at any water-works in the country. It will be of earth; its length will be 1445 feet; its greatest height, 112 feet. The contract for the work was ultimately let to Messrs. H. Arnold and Son, whose tender was £437,182. When completed, the Leighton reservoir, which is some 41 miles from Leeds, will be connected with the present source of supply in the Washbourn Valley by means of an aqueduct 24 miles long. The aqueduct will convey the water to the Swinsty reservoir; and at one point it passes through the hillside by way of the Kettlesing tunnel, which has recently been completed at an approximate cost of £100,000. At the tunnel outlet, however, there is a bye-pass by means of which, in cases of necessity, the water can be conveyed past the Swinsty reservoir and direct into the mains which bring the supply down to Eccup.

Members of the City Council and others, to the number of about a hundred, journeyed to the site of the reservoir on Tuesday; and after a short religious service, Mr. W. S. Arnold, a member of the firm of Contractors, presented Mr. Ogden with a handsome silver-mounted spade. In acknowledging the gift, Mr. Ogden remarked that the reservoir would take eight years to construct. He then cut the sod, which was wheeled away by Mr. E. A. Hirst, the Deputy-Chairman of the Water Committee. Luncheon was then partaken of, after which the company inspected the site of the Colsterdale reservoir and the temporary village ready to accommodate up to 1000 men and their families when work is in full swing. Afternoon tea on the lawn at the Corporation Bungalow just below followed; and then the visitors returned to Masham, where dinner was provided.

WIDNES WATER-WORKS EXTENSIONS.

A New Pumping-Engine Started.

A new pumping-engine, at Stocks Well, in connection with the water supply of Widnes, was started on Monday of last week; the ceremony being witnessed by a numerous gathering of members of the Corporation, officials, and others. The engine has been called the "Henry Sutton Timmis," which is the name of the Chairman of the Gas and Water Committee, whose wife was presented with a gold key, suitably inscribed, with which the engine-house was opened—the engine being subsequently set at liberty by the removal of ribbons on the starting-wheel.

A minute inspection was then made of the machinery and boreholes; and after refreshments had been served in a marquee, a hearty vote of thanks was accorded to Mrs. Timmis for having performed the opening ceremony.

Alderman Timmis, on behalf of his wife, said he was extremely grateful for the expression of opinion; and he could only say that it was a great pleasure for her to be present that afternoon. They had both striven to do something for the town that had done so much for them. Those present would wonder why they had gone to the trouble and expense of putting down this new plant, which was more than adequate to provide for the town's consumption of water; but they had to contend with any possible failing on the part of their other engines, and by treating the earth as a reservoir they had saved between £70,000 and £80,000. There was also a plentiful supply at Netherley; while at Belle Vale there was a lot of water running to waste. At present they had everything they required; but they must look into the future. Collieries were springing up around; and these in later years might injure their supply. Against this they had the right to a supply from Liverpool, if they lost their own; but they must bear in mind that in buying water from them the cost would be 200 per cent. greater than at present. As to Mr. Isaac Carr, their Engineer, he said the gas and water works were managed by one of the ablest engineers in the country.

Mr. Carr remarked that he was so well satisfied with what had been done, that if he had to go over the work again he would not alter it in one particular.

Mr. Tom Smith proposed a vote of thanks to the Contractors (Messrs. Hathorn Davey and Co., Limited, of Leeds, for the engine and pumps, and Mr. R. Ellison, of St. Helens, for the buildings); and Mr. Towler, on behalf of the first-named firm, briefly responded.

The Stocks Well Pumping-Station was erected in 1868 by the Widnes Local Board, with a pair of 50-H.P. double-acting beam condensing engines, each having a pumping capacity of about half-a-million gallons per diem. They were fixed to pump from No. 1 well, which was in the first place sunk to a depth of 60 feet without any borehole. As the demand for water increased, a second engine, the "Frederick H. Gossage," was erected in 1877. This engine had originally a pumping capacity of about 1 million gallons per diem; but this was, in 1887, increased to 1½ million gallons. This engine has been in constant use day and night for thirty years, and is still retained as a duplicate. During the course of years, the pumping level of the water has continued to fall. When the capacity of the "Gossage" engine was increased to 1½ million gallons per diem, by fixing new pumps with the suction 150 feet down, the pumping level was further lowered to about 100 feet. It was, however, noted with interest that the 1½ million gallons per diem rate of pumping did not lower the pumping level below the 100 feet during about sixteen years. From this it was rightly assumed that the station was exceptional, as the supply of water (which is excellent in quality) was unusually abundant. For ten years the "Gossage" engine was the only available plant at this station; the original beam-engines having been rendered useless owing to the fall in pumping level of the water.

After careful and prolonged consideration, it was decided in 1905 to proceed with the erection of a duplicate set of pumps at Stocks Well; and having regard to the fact that the pumping level had remained practically stationary for so long, it was resolved to put in pumps with a capacity of 3 million gallons per diem, as it was felt that the station was capable of yielding this quantity, with, of course, a still lower water pumping level. In anticipation of this further fall, the new work was designed with the suction 250 feet below the ground level. Boreholes only have been sunk; and it is estimated that the substitution of this system of obtaining water has resulted in a saving of some £40,000. In other words, had wells suitable in size and depth for pumps of this capacity been sunk, the amount of additional capital outlay would have been not less than £40,000, which would have considerably more than doubled the cost of the works.

The new engine is one of Messrs. Hathorn, Davey, and Co.'s latest type of horizontal high-duty triple-expansion surface-condensing Corliss engines, having cylinders 23, 38, and 60 inches diameter respectively. It is guaranteed to raise 3 million gallons of water from a depth of 250 feet to the surface, and force it into the reservoirs at Pex Hill, two miles distant, and 150 feet above the surface—making a total lift of 500 feet, including friction—at a speed of 14 double strokes per minute, with superheated steam at 180 lbs. pressure on every 1000 lbs. of steam used.

The whole of the boiler-house and engine-house foundations, also the engine and pump beds, which include the surface suction tank for the force pump, have been made in ferro-concrete; and this work was carried out by the Corporation's own men. For utilizing the waste heat in the furnace gases, a safety fuel economizer is fixed behind the boilers. The economizer consists of 32 6-feet double pipes cast in one. The apparatus is exceptionally strong in construction, each pipe being tested to 500 lbs. hydraulic pressure; and the whole, when put together, is tested to 400 lbs. pressure. The portion of the building over the open lift-pumps has been carried to a height of 42 feet, to give headroom for drawing the borehole pump-rods. At the top of these walls is fixed a steel framing capable of sustaining a safe load of 30 tons, to which the borehole lifting gear is attached.

The total cost of the scheme, when all is finally completed, will probably be about £15,500. The specified test for efficiency duty has not yet been made; but from observations taken, it has been ascertained that a sufficient saving in coal from that required for working the "Gossage" engine will be effected to pay the interest and sinking fund on the capital expended on the new work. In other words, the new extension, with its high commercial value, becomes an asset of the Corporation practically free of cost. The present resources of Widnes as regards its water supply are sufficient for a town of 260,000 inhabitants with water at the rate of 30 gallons per head per diem.

St. Ives (Cornwall) Water Supply.—It has been decided by the St. Ives Town Council to apply to the Local Government Board for powers to borrow £13 000 for the construction of new water-works. The undertaking has been rendered necessary by the opening up of mines in the area from which the present supply is derived. The owners of these mines have agreed to pay the Corporation £3000 for their rights; and this sum will be utilized to pay off the debt on the undertaking. In regard to the new works, which have been designed by Mr. A. P. J. Cotterell, M.Inst.C.E., it is estimated that the total cost will be £12,500; but Mr. R. S. Read, the Chairman of the Special Works Committee, explained to the Town Council that it was thought desirable to borrow the larger sum, so as to be on the safe side. With an expenditure of £13,000, and the income from water-rents as at present, there would be a deficit of £320 per annum, which would necessitate an addition to the water-rate of 4d. in the pound. It was hoped, however, that increased revenue would be derived from buildings in the higher portions of the district now without water, but which could be supplied from the proposed new source. It was also resolved that Mr. Cotterell should be the Engineer for carrying out the scheme, a brief description of which appeared in the "JOURNAL" for April 7 last (p. 49).

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

One of the most foolish of municipal actions ever heard of is threatened to be perpetrated in Edinburgh on Wednesday next, in the opposition by the Corporation of Edinburgh, before a Parliamentary Commission, of the Provisional Order which is being promoted by the Edinburgh and Leith Gas Commissioners. The situation has arisen in this way: The Corporation of Edinburgh elect fifteen representatives to the Gas Commission, and the Corporation of Leith elect six. Edinburgh has thus a preponderating voice in the Gas Commission; but the Town Council of Edinburgh contains fifty members, and thus the representatives whom they appoint to the Gas Commission are in a minority in the Council. Two things are objected to in the Provisional Order by a section of the Council. These are the proposal to reduce the illuminating power of the gas from 20 candles, and to fix the testing-station for the gas at the Granton Gas-Works. The proposal of the Gas Commission was to make the minimum candle power 14; but, in a conference between Committees of both bodies, the representatives of the Gas Commission agreed to make the minimum 16 candles. They also agreed, if the testing-station were to be retained at Granton, to supply gas of 16 candles at Granton, and of not less than 14 candles at the City Chambers, in the centre of the city. These terms were not considered satisfactory by a section of the Council; and at a meeting on Tuesday the opposition to the Order was pronounced. The Lord Provost's Committee had been controlled by the opposition to the extent that they recommended the Council to oppose the Order. Treasurer Harrison, in the Council, moved disapproval of the recommendation. Bailie Maxton considered it would be ridiculous on the part of the Council to fight the Gas Commission. The Council had a majority of representatives on the Commission, and surely they were able to look after the interests of the citizens. Mr. Leishman, interrupting, declared emphatically that they never did. This expression Lord Provost Gibson asked Mr. Leishman to withdraw, but he declined. Discussion of a heated nature ensued. Mr. Chisholm, a member of the Gas Commission, declared it to be a shame "that they should have to pay for 16-candle gas when they did not get anything like it." On the suggestion of the Lord Provost, the Town Clerk made an explanation of the situation, and how it had arisen, which provoked the question from Mr. Leishman as to whether he was acting for the Gas Commission. At the conclusion of the statement, Mr. Chisholm said he considered it so unfair and so disgraceful—not, I understand, the statement itself, but the giving of permission to make it—that he should never come back to the Town Council. He accordingly left. The discussion was continued for some time, and then the Council divided. Twenty-two voted upon each side, which the Lord Provost interpreted to mean that the opposition must go on. A Special Committee was appointed to conduct the opposition before the Parliamentary Commission. This Committee sat for several hours on Wednesday preparing their case. It is understood they agreed to ask for a conference with representatives of the Gas Commission, with the view, if possible, of coming to an arrangement before the Parliamentary Commission meets. This was a suggestion made in the Town Council after the vote was taken; but Lord Provost Gibson characterized it as incompetent—the resolution to go on with the opposition having tied the hands of the Council. It is difficult to conceive that any opposition which may be offered on Wednesday can be effective. The Gas Commissioners have a reason for what they are proposing, and the trend of gas legislation is in their favour; whereas on the other side the mind searches in vain for a substratum of facts upon which to base a case, and all that is left to support it can only be a groundwork of fears—the outgrowth of hastily-formed and ill-considered opinions.

The Selkirk Gas Company held their annual meeting on Tuesday—Mr. George Roberts in the chair. Mr. A. F. Roberts moved that the bonus of 2½ per cent., proposed by the Directors to be paid in addition to a dividend of 10 per cent., be not paid. By doing so, he said, the Company would be breaking the agreement with the manufacturers that the dividend should not be greater than 10 per cent. At the time the agreement was entered into, there was a question of erecting opposition gas-works, either by the manufacturers or the Town Council. Treasurer Bolster, representative of the Town Council, acting on the instruction of the Council to support such a motion, seconded. The Council, he said, had always considered that the agreement was still in force; and the proposed purchase of the gas-works was brought forward in view of a possible increase in the dividend, and to preclude such a thing. He asked why the gas was retained at the same price as last year, seeing that coal was now 6d. per ton cheaper, while last year the price of gas was reduced, notwithstanding that there was an increase in the price of coal by 10d. per ton. The Chairman replied that in reducing the price they always looked to the future, to see if the reduction would be maintained. Only the mover and seconder supported the motion; and it was accordingly agreed that the bonus be paid—the Directors' report being adopted. At a meeting of the Town Council on the previous evening, Treasurer Bolster made a statement regarding the position they would have been in if the gas transfer had been proceeded with; bringing out that the promoters of the transfer had understated their case by £71. They might congratulate themselves that the figures which they placed before the ratepayers had been proved to be absolutely correct, notwithstanding anything which might be said to the contrary. Ex-Provost Sim, who was the principal promoter of the transfer, has published in a local newspaper a defence of his position, in which he brings out that the profit on the first year's working would have been over £200, after paying the instalment of the purchase price and interest on the loans. He also replies, somewhat caustically, to the criticisms to which I referred last week; and calls upon the opponents of the scheme, who, on the eve of the poll, made the statement that the Company were willing to agree to restrict their dividend, to obtain from the Company the arrangement for restriction of dividend to which they said the Company were willing to agree.

In the Hamilton Town Council on Tuesday, the Gas Committee reported that the net profit upon the working of the gas undertaking for the twelve months was £3946, which included £1699 brought forward from the previous year. It was agreed to carry forward the balance. On the recommendation of the Committee, the price of gas was reduced from 2s. 3½d. to 2s. 1d. per 1000 cubic feet to ordinary consumers—being the rate in force prior to a year ago.

The Directors of the Cupar Gas Company, Limited, reported to the annual meeting last week that the amount at the credit of the profit and loss account for the year was £1106, and the balance brought forward was £364, making £1470, out of which they recommended

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 159.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 10	10	Alliance & Dublin 10 p.c.	19 - 20	..	5 0 0
268,324	10	,,	7	Do. 7 p.c.	13 –14	..	5 0 0
310,000	Stk.	July 15	4	Do. 4 p.c. Deb.	99 –102*	+1	3 18 5
200,000	5	May 29	6½	Bombay, Ltd.. . . .	6 –6¼	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4¼ –4⅜	..	5 9 6
50,000	10	Feb. 27	14	Bourne- mouth Gas and Water { 10 p.c. . . B 7 p.c. . Pref. 6 p.c.	28 –29	..	4 16 7
51,810	10	,,	7		16½ –16⅝	..	4 3 7
53,200	10	,,	6		14½ –15½	..	3 17 5
380,000	Stk.	,,	12½	Brentford Consolidated	242 –247	..	5 1 3
300,000	,,	,,	9⅜	Do. New	180 –185	..	5 2 8
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120 –125	..	4 0 0
206,250	,,	June 12	4	Do. 4 p.c. Deb. .	100 –105	..	3 16 2
220,000	Stk.	Mch. 12	11½	Brighton & Hove Orig.	208 –213	+3	5 5 5
246,320	,,	,,	8½	Do. A. Ord. Stk. .	152 –157	..	5 5 1
460,000	20	Mch. 27	10	British	42 –43	..	4 13 0
104,000	Stk.	Feb. 13	6	Bromley, Ord. 5 p.c. .	116 –119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c. .	86 –89	..	5 1 2
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	11 –11⅛	..	6 1 9
850,000	Stk.	June 26	4	Do. 4 p.c. Deb. .	91 –93	..	4 6 0
150,000	20	July 15	7½	Cagliari, Ltd.	24 –25*	+⅛	5 16 0
100,000	10	—	—	Cape Town & Dis., Ltd.	4 –6	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.. .	5 –7	..	6 8 7
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	45 –48	..	6 5 0
103,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	80 –85	–6½	5 5 11
157,150	Stk.	Feb. 27	5	Chester 5 p.c. Ord. .	111 –113	..	4 8 6
1,493,280	Stk.	Mch. 12	5⅝	Commercial 4 p.c Stk. .	106 –111	+2	4 13 8
560,000	,,	,,	5	Do. 3½ p.c. do. .	101 –106	+1	4 14 4
475,000	,,	June 26	3	Do. 3½ p.c. Deb. Stk.	81 –83	..	5 12 3
800,000	Stk.	June 12	6½	Continental Union, Ltd.	112 –117	..	5 11 1
220,000	,,	,,	7	Do. 7 p.c. Pref.	136 –141	..	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk. . .	121 –123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk. . .	103 –105	..	3 16 2
148,995	,,	Mch. 31	5	East Hull 5 p.c. Ord. .	100 –103	..	4 17 1
486,090	10	July 15	12	European, Ltd. . . .	22½ –23⅛*	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	16 –17*	..	5 5 10
15,182,590	Stk.	Feb. 13	4⅛	Gas- light and Coke { 4 p.c. Ord. . . 3½ p.c. max. . . 3 p.c. Con. Pref. 3 p.c. Con. Deb.	97½ –58½	..	4 10 3
2,600,000	,,	,,	3½		87 –90	..	3 17 9
3,799,735	,,	,,	4		106 –109	..	3 13 5
4,193,975	,,	June 12	3		81 –85	..	3 10 7
258,740	Stk.	Mch. 12	5	Hastings & St. L. 3½ p.c.	93 –95	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	112 –115	..	5 13 1
70,000	10	Apl. 29	11	Hongkong & China, Ltd.	18 –19	..	5 15 9
4,940,000	Stk.	May 14	8	Imperial Continental .	180 –183	+1	4 7 5
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	95 –97	+2	3 12 2
195,242	Stk.	Mch. 12	6	Lea Bridge Ord. 5 p.c. .	113 –118	..	5 1 8

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
551,000	Stk.	Feb. 27	10	Liverpool United A . .	232 –234	..	4 5 6
718,100	,,	,,	7	Do. B .	165 –167	..	4 3 10
306,083	,,	June 25	4	Do. Deb. Stk.	104 –106	..	3 15 6
152,736	Stk.	Feb. 13	7⅞	Maidstone 5 p.c. . .	136 –141	..	5 8 2
75,000	5	June 26	6	Malta & Medn., Ltd. .	4¼ –4⅝	+⅛	6 6 4
560,000	100	Apl. 1	5	Met. of { 5 p.c. Deb..	101 –103	+1	4 17 1
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	101 –103	+1	4 7 5
541,920	20	May 29	3½	Monte Video, Ltd. . .	11 –12	..	5 16 8
1,775,892	Stk.	Feb. 27	4⅝	Newc'tle & G'tesh'd Con.	108 –109	..	4 4 10
418 463	Stk.	June 26	3½	Do. 3½ p.c. Deb.	90 –91	..	3 16 11
15,000	10	Feb. 27	10	North Middlesex 10 p.c.	23 –24	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½ –14½	..	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd. . . .	140 –143	..	5 11 11
60,000	5	Mch. 27	7	Ottoman, Ltd. . . .	6 –6½	..	5 7 8
398,490	5	Apl. 29	7	Primitiva Ord. . . .	6 –6⅛	–⅛	5 7 8
796,980	5	Jan. 30	5	Do. 5 p.c. Pref. .	5 –5⅛	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	91 –93	..	4 6 0
1,000,000	10	Apl 29	8	River Plate Ord. . . .	13½ –13⅝	..	5 16 5
312,650	Stk.	June 26	4	Do. 4 p.c. Deb. .	91 –93	..	4 6 0
250,000	10	Apl. 10	8	San Paulo, Ltd. . . .	13½ –14	..	5 14 4
125,000	50	July 1	5	Do. 5 p.c. Deb. .	49 –51	..	4 18 0
135,000	Stk.	Mch. 12	10	Sheffield A	245 –246	+½	4 1 4
209,984	,,	,,	10	Do. B	244 –246	..	4 1 4
523,500	,,	,,	10	Do. C	244 –246	..	4 1 4
70,000	10	May 29	10	South African	13 –14	..	7 2 10
6,429 895	Stk.	Feb 13	5½	South Met., 4 p.c. Ord.	118 –120	..	4 8 10
1,895.445	,,	July 15	3	Do. 3 p.c. Deb.	83 –85*	+½	3 10 7
209 810	Stk	Mch. 12	8	South Shields Con. Stk.	155 –157	..	5 1 11
605, 00	Stk.	Feb. 27	5⅜	S'th Suburb'n Ord. 5 p.c.	116 –119	..	4 9 7
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	120 –125	..	4 0 0
117,058	,,	July 15	5	Do. 5 p.c. Deb. Stk.	120 –122*	+½	4 0 0
502,310	Stk.	May 14	5	Southampton Ord. . .	105 –110	..	4 10 11
120,000	Stk.	Feb. 27	6¾	Tottenham { A 5 p.c. .	120 –125	..	5 8 0
398,940	,,	,,	5¼	and { B 3½ p.c.	107 –109	+1	4 16 4
149,470	,,	June 25	4	Edmonton { 4 p.c. Deb.	98 –103	..	3 17 8
182,380	10	June 12	8	Tuscan, Ltd.	10 –10½	..	7 12 4
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	97 – 99	..	5 1 0
193,742	Stk.	Feb. 27	5	Tynemouth 5 p.c. max.	106 –107	..	4 13 6
255,636	Stk.	Feb. 13	6¼	Wandsworth { B 3½ p.c. . .	128 –133	..	4 17 9
80,075	,,	June 26	3	and { 3 p.c. Deb. Stk	72 –77	..	3 17 11
				Putney {			
845,872	,,	Feb. 27	5½	West Ham 5 p.c. Ord.	100 –102	..	5 0 6
185,000	,,	,,	5	Do. 5 p.c. Pref. .	120 –125	..	4 0 0
228,300	,,	June 26	4	Do. 4 p.c Deb. Stk.	100 –102	..	3 16 2

Prices marked * are "Ex div."

payment of a dividend on the preference stock of 5 per cent., and on the ordinary stock of 35s. per share, and that £400 be added to capital for depreciation; leaving £377 to be carried forward. They recommended also that the price of gas be reduced from 4s. 2d. to 3s. 11½d. per 1000 cubic feet, with a discount of 2½d. per 1000 cubic feet on ordinary accounts of £15 a year and upwards. The Chairman—Mr. W. Thomson—said that the affairs of the Company had been steadily progressing during the year. They had now reached the quantity of 24½ million cubic feet of gas manufacture for the year—practically half-a-million feet better than the year before. Their show-room had been taken advantage of by the public to a considerable extent, and he was glad to say that it was self-supporting. The Company derived from prepayment meters an income of no less than £507, largely in pennies. They had sold a considerable number of cookers, grillers, and the like. They were now in a position to fit up radiators for heating, which, in future, would probably be an outlet for their gas. They had contracted for coal at a reduced figure; but the lower cost would only warrant a reduction in the price of gas by 1½d. per 1000 cubic feet. The Directors, however, decided to give consumers the benefit of the reduction; and they recommended that the price be reduced by 2½d. The report and the recommendation of the Directors were adopted.

In the Broughty Ferry Town Council on Monday, it was reported that last year they estimated for a credit balance of £180 in the Gas Department, and the actual balance was £513. It was agreed to reduce the price from 3s. 4d. to 3s. to ordinary consumers, and from 3s. 9d. to 3s. 4d. for gas consumed through prepayment meters. The estimated surplus for the current year is £88.

The annual meeting of the Brechin Gas Company, Limited, was held last Wednesday. Mr. James Guthrie, J.P., who presided, moved the adoption of the Directors' report and balance-sheet. He said there was £300 less cash in the bank than at the same date last year; but they had on hand £300 worth more of coal than they had then. Their revenue from gas for lighting showed an increase of £100. In past years they largely depended upon stoves for their increased consumption; but lighting was now more than holding its own. The income from residuals had increased by £70; there having been a good demand for coke. Sulphate of ammonia and tar had, however, decreased by £30. In all, there was an increase in profit of £102 over last year. The Directors had held a meeting with all the employees, and each of them had received a bonus of two weeks' wages. This was to show that the Directors recognized the share the men had had in bringing out so good a balance-sheet. A dividend of 7 per cent. was declared, and the remuneration of the Directors increased from £50 to £75.

The annual meeting of the Montrose Gaslight Company was held last Wednesday. The Manager—Mr. A. Mackay—submitted his annual report, in which it was stated that the quantity of gas made during the year was 32,175,400 cubic feet—an increase of 1,034 400 cubic feet; the production of gas being the largest in the history of the Company. During the year 391 meters had been fixed, of which 134 were for new consumers. The number of boiling-rings, grills, cookers, and gas-fires fixed amounted to 226. A dividend of £2 2s. 6d. per share was declared. The Manager and the Secretary were re-appointed.

The Burntisland Town Council on Monday considered the annual accounts and estimates in connection with the gas undertaking. The report by the Manager—Mr. A. Ross—stated that the consumption of gas was still on the increase, and had gone up 500,000 cubic feet during the past half year. The Clerk drew attention to the fact that in 1897 the consumption was 10 million cubic feet, and that in 1907 it had doubled, having gone up to over 20 millions in the ten years.

The annual meeting of the Kelty Gas Company, Limited, was held on Thursday—Mr. Charles Carlow presiding. The affairs of the Company, as shown by the abstract of accounts, disclosed a profit on the year's working of £1178. From this there had been paid as interest on loans £218; leaving a net balance of £960, from which the Directors recommended a dividend of 7½ per cent., absorbing £525, and the carrying forward of £435. In moving the adoption of the accounts, the Chairman said the Articles of Association precluded their reducing the price of gas till the arrears of cumulative interest had been paid; but as they hoped to wipe these off next year, the sliding-scale under which they worked would then ensure for the people of Kelty a cheap gas. The balance-sheet disclosed the concern to be sound; and he had no doubt at all in his own mind as to its future prosperity. The report was adopted.

The Cowdenbeath Town Council on Tuesday consulted with their legal adviser—Mr. W. Burt—upon the proposal they made for the transfer of the undertaking of the Gas Company, and resolved to ask the Company to allow a valuator on their premises before further action is taken.

The quantity of gas made in the works of the Vale of Leven Gas Company, Limited, at Alexandria, during the past year was 56,647,000 cubic feet—an increase of over 1½ million cubic feet. A dividend of 5 per cent. has been paid.

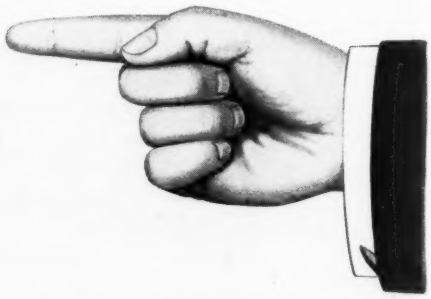
The Kirriemuir Gaslight Company, Limited, have reduced the price of gas from 4s. 10d. to 4s. 7d. per 1000 cubic feet, with a discount of 5 per cent. to ordinary consumers, and a further discount of 5 per cent. to users of gas-engines who consume more than £5 worth of gas in the year.

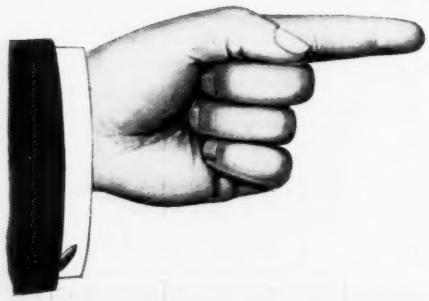
The Duns Gas Company have added £100 to their reserve fund, and paid a dividend of 8s. on each cumulative share of £6 5s.

A discussion took place in the Kilsyth Town Council on Monday with reference to the price of gas. Bailie Jarvie, the Convener, said that the Gas Committee had considered the matter, but were divided upon the subject. They were quite able to afford a reduction of 2½ d. all over; and he moved to this effect. The proposition was unanimously agreed to.

The Bathgate District Committee of the Linlithgow County Council have, on a requisition by the ratepayers, agreed to form the Blackridge district into a special lighting district. It is proposed to lay a main from the Armadale Gas Company's works to Blackridge village, a distance of 2½ miles.

The "BORDO."





IN GROWING DEMAND!

The "Bordo" offers a golden opportunity of reaping the harvest of increased returns.

The only Gas Cooker on the market specially designed to meet the peculiar requirements of Boarding Houses, small Hotels, Restaurants, and similar Establishments.

JOHN WRIGHT & CO.,
ESSEX WORKS, BIRMINGHAM.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *July* 18.

The market has again been extremely quiet, and makers have only been able to effect sales by making further concessions in prices. Buyers abroad, having deliveries to take against contracts made in advance, are not interested in the spot market, and direct orders have been very scarce. Consequently, the closing quotations are not over £11 per ton f.o.b. Hull, £11 2s. 6d. f.o.b. Liverpool, and £11 5s. f.o.b. Leith. Interest in the forward position is sustained, and buyers would pay some advance on spot prices for December-March, or January-April delivery; but makers are not willing to contract at less than £11 10s. or £11 12s. 6d. per ton. In the meantime, speculative sellers have become less keen about forward business.

Nitrate of Soda.

This article is quiet in all positions. Spot quotations are 10s. and 10s. 3d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *July* 20.

The markets for tar products are practically without change. Pitch is still weak, and there is a decided disinclination among consumers to purchase any further quantity for delivery this year; while for January-June they will not consider prices which are anything in advance of to-day's prompt figures. On the Continent, business is reported to have been done for the whole of next year on the basis of the prices now ruling. In South Wales, a very large business has been done at low figures for delivery between now and the end of June next. Creosote is steady without any alteration in price, and there is a good demand for same in London. Makers, generally, are well sold, and are apparently quite willing to await the course of events before placing any considerable quantity. Benzol is weak. It is possible to buy at 7½d. London, and 7d. in the North, for prompt delivery. For 50-90 per cent. benzol and toluol, there is no demand; while solvent naphtha is quiet. For heavy naphtha, there is a fair amount of inquiry, but buyers' ideas are very low. Carbolic acid is weak. Continental consumers report having declined offers of 1s. 5d., east coast, for delivery to the end of the year. Naphthalene maintains its price; while creosote salts are firm.

The average values during the week were: Tar, 11s. 6d. to 15s. 6d., ex works. Pitch, London, 18s. 6d. to 19s.; east coast, 17s. 6d. to 18s.; west coast, 17s. to 18s., f.a.s. Benzol, 90 per cent., casks included, London, 7¼d. to 7⅜d.; North, 7d. to 7⅛d.; 50-90 per cent., casks included, London, 7⅜d.; North, 7d. Toluol, casks included, London, 7⅜d. to 8d.; North, 7¼d. to 7⅜d. Crude naphtha, in bulk, London, 3¼d. to 3½d.; North, 3d. to 3¼d.; solvent naphtha, casks included, London, 10d. to 10¼d.; North, 9d. to 9¼d.; heavy naphtha, casks included, London, 9¾d. to 10¼d.; North, 8¾d. to 9¼d. Creosote, in bulk, London, 2⅛d. to 2⅜d.; North, 2d. to 2⅛d. Heavy oils, in bulk, 2⅜d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 5d. to 1s. 5¼d.; west coast, 1s. 4¾d. to 1s. 5d. Naphthalene, £4 10s. to £8 10s.; salts, 35s., packages included and f.o.b. Anthracene, "A" quality, 1⅛d. to 1⅜d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is quiet, and prices have declined throughout the week. The principal Gas Companies quote £11 8s. 9d. to £11 10s. for September-December, but London makes can be obtained on Beckton terms at £11. In Hull, business has been done at £11 to £11 1s. 2s. 6d.; and in Liverpool, at £11 1s. 3d. and £11 2s. 9d. In Leith, £11 5s. has been accepted.

COAL TRADE REPORTS.

Lancashire Coal Trade.

It is not true to say that the coal trade in the Lancashire district is depressed, because high prices are maintained, but it is true, nevertheless, that orders have fallen off very considerably, especially for house, steam, furnace, boiler, and engine fuel. The shipping trade also shows a decline. Both iron and cotton trades are dull. So much short time is being worked, allied also with the holiday season, when town after town has its "wakes," that for the next two months at least very much less coal will be required. Gas coal, of course, is going out on contracts, most of which have been concluded with gas undertakings for the ensuing twelve months. Retail prices are very high; and at the pits the following rates obtain: Best house coal 14s. 6d. to 15s. 8d., secondary 13s. 2d. to 14s., common 11s. 2d. to 12s. 8d., burgy 10s. 6d. to 11s. 4d., best slack 9s. to 10s., medium 8s. 6d. to 9s., lower qualities 7s. 9d. to 8s. 4d., coal for shipping 13s. to 14s. f.o.t. at the tips, furnace coke 18s. to 24s.

Northern Coal Trade.

There has been rather more activity in the coal trade in the last few days; and the prices have shown a little advance for some kinds of fuel. In the steam coal trade, this has been marked; and for the rest of this month it is expected that there will be some scarcity for the best steams. Prices are based on about 14s. per ton f.o.b. for best Northumbrian kinds, early delivery—some collieries having little to sell for the next three weeks. Second-class steams are 11s. 9d. to 12s. 3d. per ton f.o.b., and steam smalls from 5s. 9d. to 6s. 9d. In the gas coal trade, the demand for home use is a little fuller, and the exports continue heavy. Durham gas coals are being quoted from about 10s. to 11s. per ton f.o.b. for ordinary kinds, and from about 11s. 6d. for the special classes. As to contracts, one or two have been made for good Durham gas coal for shipment to Genoa over this and next year at 15s. 6d. to 15s. 9d. per ton, delivered at the Italian port named—a rate, with current freights, about equal to 10s. 1½d. per ton

Success of the Screwless Cooker.

(PATENT No. 4655.)

THE "NEW DAVIS" SCREWLESS COOKER has proved its claims to LEADERSHIP—firstly, by the large amount of new business it is bringing in daily; secondly, by reason of the publicity accorded to it by a competitor's ad-writer.

THE "NEW DAVIS" SCREWLESS COOKER has been adopted by 153 Gas Undertakings this season—in most cases, strangely enough, at the expense of our obliging competitor.

May we add your name to the list of Regular Buyers?

DAVIS—the Gas Stove People.

CAMBERWELL, LONDON, S.E.

f.o.b. Other smaller contracts are settled at somewhat similar figures; but the chief producers of gas coals have now the bulk of their output well taken up forward. Coke is steady; and gas coke shows no alteration of moment—good descriptions being about 15s. per ton f.o.b.

Scotch Coal Trade.

The spell of the holidays is over the coal trade in Scotland, particularly in the west, where idleness is extensive. Many large works are not to open again till the 3rd of August—a circumstance which has had a depressing effect upon the demand for coal. The shipping trade alone is active. Prices have receded somewhat, and are quoted at: Ell 10s. 6d. to 12s. 6d. per ton f.o.b. Glasgow, splint 10s. 6d. to 10s. 9d., and steam 9s. 9d. to 10s. The shipments for the week amounted to 309,207 tons—a decrease of 25,319 tons upon the previous week, and of 4110 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,249,776 tons—a decrease of 433,305 tons upon the corresponding period of 1907.

Cheaper Gas for Stockport.

The Stockport Gas Committee have agreed to the following amended scale of allowances for large consumers of gas for industrial purposes, to be adopted from the September quarter: Over 500,000 but under 1,000,000 cubic feet per annum, 1d. per 1000 cubic feet. Over 1,000,000 but under 2,000,000 cubic feet per annum, 2d. per 1000 cubic feet. Over 2,000,000 but under 3,000,000 cubic feet per annum, 3d. per 1000 cubic feet. Over 3,000,000 but under 4,000,000 cubic feet per annum, 4d. per 1000 cubic feet. Over 4,000,000 cubic feet per annum, 5d. per 1000 cubic feet. The allowances are to be made in conjunction with the differential discounts on the number of hours of working in force, but subject to the rule that the two discounts together shall not reduce the price lower than 1s. 3d. per 1000 cubic feet inside the borough, and 1s. 6d. per 1000 cubic feet outside the borough. The Committee have also decided to allow the automatic meter consumers an additional 1d. in the shilling discount. The two concessions will cost the department about £1300 per annum, on the consumption of last year.

Mansfield Municipal Undertakings.—At the last meeting of the Mansfield Town Council, the Gas Committee presented a report for the year ended March 31 showing that the gross profits on the twelve months' working had been £7242. After allowing for interest on loans, &c., a net profit remained of £2163. The receipts from the sale of gas were about £500 more than in the previous year. The Water Committee reported that the gross profit on the year's working amounted to £7235, and that a net profit of £3364 had been made after paying interest on loans, &c. The Electricity Committee reported a gross profit of £3979, and a net profit of £553.

Fatality at the Bexhill Water-Works.

At the new pumping-station of the Bexhill Water and Gas Company at Hazard's Green, Ninfield, on Monday last week, two of the employees, named Croft and Milner, lost their lives. The former fell down the ladder in the well, and the latter, in attempting to rescue him, was overpowered by foul air, and also fell. At the Coroner's inquiry into the matter the following day, Alfred Hayes, an engineer in the service of the Company, said the well was 190 feet deep, and he had been down it 140 feet without meeting foul air; a lighted candle having been lowered to within a short distance of the water, which was 170 feet from the top. The men had general instructions as to testing the well; but no one was told off to see that they were carried out. Mr. R. W. Huggett, the Engineer in charge of the works during their construction, said he was 71 feet down the well the previous Friday. It was tested in the usual way, and there was no indication of poisonous gas. Mr. M. Peirce, the Resident Engineer to the Company, said he had been down the well many times, and had never detected foul air. His theory was that the accumulation of gas on the day of the accident was due to atmospheric influence. He would have gone down the well without testing it, as he had a feeling of security, because nothing had happened there. Dr. R. C. Middleton said the cause of Croft's death was suffocation; and Milner, in his opinion, inhaled a moderate dose of gas which rendered him semi-conscious and caused him to fall and fracture his skull. Everything was done to disperse the gas; and he did not think there was negligence on the part of anybody. In summing up, the Coroner (Mr. C. Sheppard) expressed the opinion that it should be a rule that no man should go down a well before precautions were taken; and there ought to be on the spot proper apparatus, such as a fan, to disperse foul air. He added that the evidence pointed to the conclusion that the deaths were due to accidental circumstances. The Jury found that the deaths were the result of suffocation. They said they thought someone in authority ought to see that the well was properly tested before men went down; and, further, that a fan should be used for dispersing poisonous air when necessary. The Secretary of the Company (Mr. R. D. Jesty) promised to convey these suggestions to the Directors.

Large Waste of Water at Sudbury.—At the last meeting of the Sudbury Town Council, Mr. Savage, in moving the adoption of the report of the Water Committee, called attention to the waste of water which had been taking place recently during the night. He stated that one night the water in the well dropped 4 feet. Mr. Hitchcock said that from ten o'clock one Sunday night until six o'clock next morning 30,000 gallons of water had gone out of the reservoir. There were no business premises or breweries open which could require any water during that time. The Mayor (Alderman H. H. Baker) remarked that the same thing happened whenever there was a drought. The Surveyor (Mr. W. J. Tait) said that as soon as the wet weather came the loss of water at the reservoir lessened very considerably.

A CONVENIENT HEIGHT.

THE "MAIN" COOKER
CAN BE SUPPLIED ON STAND
AT ANY CONVENIENT HEIGHT
FOR COOKING.

R. & A. MAIN, LTD.,
LONDON. GLASGOW. FALKIRK.

Hoylake and West Kirby Gas and Water Company.

The report of the Directors and the accounts for the year ending June 30 (which will be submitted at the thirty-first ordinary general meeting on the 31st inst.) state that the balance at the credit of profit and loss, after payment of the dividends in respect of the year to June, 1907, was £1307, to which has to be added the net revenue for the past twelve months, £7338—making a total of £8645. Deducting the interim dividend paid in January (£2600), there is now available a sum of £6045. From this, the Board recommended the payment of the following dividends: 6 per cent. on the "A" gas original capital; 4⅕ per cent. on the "B" gas additional capital; 6 per cent. on the "A" water original capital; and 4½ per cent. on the "B" water additional capital. These will absorb £3899, and leave a balance of £2146. After transferring £160 to water back-dividend reserve, and £100 to water contingency fund, there will be a sum of £1886 to carry forward. The dividend scheme now announced, together with the interim dividend paid in January, makes a total distribution, less income-tax, for the year of 10 and 7 per cent. on the "A" and "B" capitals respectively. The gas reserve fund now stands at £1565. The quantity of gas supplied last year to private consumers and the public lamps was 54,403,874 cubic feet. The price of gas during the period under review was 3s. 6d. per 1000 cubic feet, less varying discounts; while the charge to users of prepayment meters was 4s. 2d.

Bankruptcy of Incandescent Burner Makers.

A sitting of the London Bankruptcy Court was held last Tuesday, before Mr. Registrar Linklater, for the public examination of Wm. George Temple and Frank Bracebridge Mills, lately trading in partnership as W. G. Temple and Co., of Kentish Town Road. The statement of affairs showed liabilities of £2110 17s. 10d., and assets valued at sufficient to yield a surplus of £1163 11s. 10d., after payment of all debts. Under examination by Mr. E. S. Grey, the Official Receiver, the debtor Temple stated that in 1905 they had a joint capital of nearly £4000 in the business. Shortly afterwards they became interested in a patent incandescent gas-burner which had been registered by Mr. Henry Howell, from whom they acquired a two-thirds interest in it, with a view to disposing of the English and foreign patents, but retaining the right of manufacture. Altogether, they incurred liabilities to the amount of £2000 in connection with the patent; and they also financed Mr. Howell to the extent of £450 for personal expenses. In September, 1907, they formed a Company, under the title of Howelite Limited, with a nominal capital of £14,600, to take over and work the patent; and, as vendors, witness, his partner, and Mr. Howell were to receive £3000 in cash and 6000 deferred shares of 1s. each. The Company, however, did not go to allotment, because no subscriptions of any amount were received. It was entirely owing to their inability to realize their interest in the burner that they were in the Court. In November last they had the first pressure by creditors; it afterwards became acute, and on the 25th of March they shut down the works and executed a deed of assignment of their property to a trustee for the benefit of their creditors. This step formed the act of bankruptcy upon which the petitioning creditors obtained the receiving order on the 21st of May. Asked further regarding the arrangement with Mr. Howell, the debtor said it was agreed that the three of them should devote their time to perfecting the burner, putting it on the market, and generally making it a commercial success. The examination of both debtors was concluded.

Brooklyn Water Supply.—The Board of Estimates of New York have sanctioned a scheme to provide a further water supply for Brooklyn and district, entailing the expenditure of nearly 9⅓ millions sterling, which will be in addition to the water scheme, to cost 32 millions sterling, which is now being carried out in the Catskill Mountains. The plan proposed is based on the development of underground waters within the limits of Suffolk County, Long Island. The main conduit which the Board of Water Supply proposes to build is to have a length of 73 miles; and a supplemental conduit, about 4 miles long, is also proposed. Near the conduit wells are to be sunk, ranging in depth from 100 to 200 feet, and located about 500 and 1000 feet apart. The combined area of the drainage district is 332 square miles; and it is estimated that a supply of 250 million gallons of water can be developed.

Plymouth "Fyshynge Feaste."—The Plymouth Town Council have decided that the Fyshynge Feaste, which had been opposed in the interests of economy, shall be held, but at less cost to the rates than hitherto. The Mayor (Sir C. Radford) had intimated to the Water Committee that he would have undertaken the whole cost of the ceremony, but for establishing a precedent which might embarrass his successors in office. He believed, however, that the people of the town would view with disfavour the discontinuance of the honour which is annually paid at the "feaste" to the memory and the work of Sir Francis Drake, who constructed the original water-works of the town. Apart from its historical interest, the event had a practical and business side in enabling the members of the Town Council to accompany the Mayor on his survey of the state and condition of the water-works. The ceremony is to be carried out next week.

Torpoint Water Supply.—An inquiry has been held at Torpoint, Cornwall, by Mr. A. W. Brightmore, M.Inst.C.E., an Inspector of the Local Government Board, respecting the application of the Urban Council for power to borrow £700 for purposes of water supply. Mr. A. N. F. Goodman explained the difficulties which had been encountered in endeavouring to obtain a supply of water, and how these had been unexpectedly solved by General Sir R. Pole Carew's discovery of abundant springs of water when constructing works for the supply of his own house. The Council had agreed to purchase the water they required from Sir R. Pole Carew, who undertook, if the venture was unsuccessful, to take over the whole of the works at the price paid for them by the Council. Mr. J. Gilbert, the Agent to Sir R. Pole Carew, said their only desire was to assist Torpoint; and if there was any doubt as to the sufficiency of the supply or the adequacy of the scheme, be hoped the Local Government Board would not sanction it.

RICHMOND'S

Some

MARCH, 1908.

The Chairman of a Gas Company writes:—

The work executed by the R. G. S. & M. Co., Ltd., was carried out with dispatch to the satisfaction of all parties, especially the new consumers; while the residents in the new part of the town, to which the Company's mains have not yet been made, are calling out for installations and extension of the system.

Very

JULY, 1908.

A Gas Manager writes:—

Your fitters have now completed 130 Installations for this Company. The whole has been carried out to the entire satisfaction of myself and Directors. Our consumption has greatly increased already. Great credit is due to your foreman. He has worked hard in this district, and handled the work in a most skilful manner, and he has the entire confidence of all whom he has come in contact.

Recent

MARCH, 1908.

A Proprietor of a Gas-Works writes:—

We should like to mention the satisfactory manner in which the work was carried out by your firm. Some 300 Automatic Installations, besides private work, was done both creditably and with dispatch.

Testimonials.

INSTALLATIONS

ADVERTISEMENT OF THE RICHMOND GAS STOVE & METER CO., LTD.
London Offices and Show-Rooms: 132, QUEEN VICTORIA STREET, E.C.
General Offices and Works: WARRINGTON, &c.

The Increased Charge for Water in London.

At the Old Street Police Court last Wednesday, before Mr. Cluer, Messrs. Silverstone, Rogers, and Co., boot and shoe manufacturers, of Hackney Road, were summoned by the sanitary authority of Bethnal Green for non-compliance with a notice requiring them to provide a supply of water on their factory premises. Mr. Margetts supported the complaint. The evidence of a Sanitary Inspector showed that there was no water supply to the closets on the premises, and this state of things had been going on since April. Notices were served, but had been disregarded. Mr. Lewis Silverstone (one of the firm) said the water supply had been cut off; and, owing to the increased demands of the Metropolitan Water Board, the firm had decided to remove to the country. The Sanitary Inspector said he had warned the defendants that if persons were on the premises during business hours, the water supply must be reinstalled. Mr. Cluer said this was wrong. No one was bound to take a supply from the Board. Mr. Silverstone remarked that a number of tradesmen were refusing to take a supply of water because of the charges. Mr. Margetts: I do not know where they are to get it elsewhere. Mr. Cluer; I can tell them, though I am not a shareholder. I can only say that I am not surprised at the outcry at the increased demands of the Water Board, many of which are absolutely iniquitous; and Parliament allows this sort of thing to go on. The defendants were ordered to pay a fine of £5 and 2s. costs.

Additional Capital for the Uxbridge Gas Company.—In compliance with instructions received from the Directors, Messrs. A. & W. Richards offered for sale last Tuesday, at the Mart, Tokenhouse Yard, E.C., £8800 of consolidated stock of the Uxbridge Gas Company, ranking for a standard dividend of 5 per cent., subject to the sliding-scale, equally with the Company's existing similar stock, on which the dividend paid for last year was at the above-named rate. The new issue was all sold at prices ranging from £97 15s. to £100 10s. per £100.

Two men employed at the Sunderland Corporation electricity supply works were injured last Friday by an explosion in a street box.

The net profit on the water-works undertaking of the Oldham Corporation for the past year was £7319, compared with £6535 during the year 1906-7.

The Gas Committee of the Heywood Town Council have resolved to reduce by 1d. per 1000 cubic feet the price of gas used for lighting purposes. This makes the net charge 2s. 9d.

A dividend of 5 per cent. on the ordinary shares of James Keith and Blackman Company, Limited, is recommended; £1000 is written off patents and goodwill, £1854 is applied to extinguishing expenditure on patterns for new specialities, and £3066 is carried forward.

According to a telegram to the United Press, a wealthy Syndicate including representatives of Switzerland, Austria, and Germany, has been formed to compete with the American Oil Trust in Europe. It is said the new Company intend joining hands with the great Russian oil firms and buy them out. The headquarters will be at Basle.

The Kennoway and Windygates Gas Company are progressing speedily with the erection of their new works at Kennoway Burns. Messrs. Henry Balfour and Co., of Leven, are the Contractors for the retort-house roof and other ironwork; while Messrs. Robert Dempster and Sons, of Elland, have been selected for the gasholders. Messrs. James Brown and Co., of Hamilton, are to build the retort-bench; and the Engineer (Mr. J. B. Scott) expects he will have the works producing gas about November. The same Contractors have secured the work for the Largo and Lundin Links Gas Company, which Mr. Scott is also erecting at present. At the latter place, about five miles of mains have been laid within the last two months—the pipes being supplied by Messrs. Cameron and Roberton, of Kirkintilloch; and the erection of the works will be pushed on with all possible speed.

By invitation of the Directors of Messrs. Ashmore, Benson, Pease, and Co., Limited, the officials and foremen of the Company paid a visit to the Franco-British Exhibition last Saturday. The party left Stockton-on-Tees just before 11 p.m. on Friday, and arrived in London early next day. After breakfast at the Great Northern Hotel, small parties were formed, and some of the principal "sights" of London were visited in the morning—starting from the Bank and ending at the Houses of Parliament and Westminster Abbey. The visitors then assembled at the Victoria Mansions Restaurant, where they were met by Mr. Emile S. Mond, a Director of the Company, and Mr. James Lawson, the London Manager. Here luncheon was served, under the presidency of Mr. Mond. At the close, Mr. Hodgson, the Works Manager, on behalf of the officials and foremen, briefly thanked Mr. Mond and the other Directors, and said their kindness and hospitality were fully appreciated by all. It was the intention of some of them who already knew London fairly well to spend the greater part of their time at the Exhibition, and particularly in that portion of it devoted to the machinery exhibits, which, from all accounts, he felt sure would prove most interesting. But those of the party who were paying their first visit to London were, he considered, doing the right thing in endeavouring to see as many of the interesting sights as possible in the time at their disposal; and he thought Mr. Mond would agree with them in this. They were all very grateful to him and the Directors for the splendid way in which they had been treated. Mr. Mond, in reply, on behalf of the Directors and himself, extended to the party a warm welcome to the Metropolis. He expressed regret at the absence of the General Manager (Mr. T. P. Barker), and at the rather unfavourable weather, but said he trusted the visitors would have an enjoyable time. He quite concurred with the remarks of Mr. Hodgson with regard to the Exhibition. Undoubtedly, the machinery exhibits were highly interesting and instructive; and he was very glad indeed that they should have this opportunity of inspecting them. He sincerely hoped they would carry back with them pleasant recollections of their visit to London. After luncheon, a start was made, *viâ* St. James's Park, for the Exhibition, where the party met at the north end of the Machinery Hall at four o'clock. The afternoon and evening were spent at the White City; and the visitors left London by the 11.50 p.m. train.

THE
PARKINSON
STOVE CO., LTD.

"CROWN"
COOKER.

Many
Important
Improvements.

THE
PARKINSON
STOVE CO., LTD.,
STOUR ST., SPRING HILL,
BIRMINGHAM.

The Kirkby-in-Ashfield Urban District Council have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for extensions to the retort-house, retort-bench, coal-store, &c., erected by them in 1905. The work is being carried out under the supervision of Mr. R. G. Shadbolt, of Grantham, the Council's Consulting Gas Engineer, and is a continuation of the designs comprised in his complete scheme for new works above mentioned.

In connection with the congress of the Royal Sanitary Institute at Cardiff, a Health Exhibition was opened on Monday last week in a large wooden pavilion near the City Hall. Among the awards made by the Judges are a silver medal to Messrs. J. Blakeborough and Sons, for Boyd's water-main drilling and tapping apparatus, and bronze medals to the following: Messrs. J. Blakeborough and Sons, for a screw-down hydrant adaptable to a ball hydrant connection; Taroads Syndicate, Limited, for a tar-spraying machine; Messrs. Rowe Bros. and Co., Limited, for lead pipes; and the Eagle Range and Gas-Stove Company, for their new "Premier" Eagle range.

Our readers may remember that Henry Warwick Gyde, one of the promoters of the Kent County Gas Company, was some weeks ago committed for trial at the Central Criminal Court on a charge of conspiring with one Darby, another of the promoters, to induce certain parties to become debenture holders in two Welsh Companies. In the King's Bench Division last Tuesday, application was made on behalf of the accused for the removal of the indictment to the King's Bench Division, on the grounds that matters would arise which ought to come before a Special Jury in that Division, and that Gyde was concerned in the notorious Brinsmead frauds, which might prejudice the case if it came before a London Jury. A rule *nisi* was granted.

APPLICATIONS FOR LETTERS PATENT.

14,292.—Fielding, J., "Gas-producer." July 6.
14,303.—Lancaster, M., "Gas-stove and wash-boiler combinations." July 6.
14,307.—Ehrich and Graetz, "Inverted incandescent gas lamps for railway carriages." July 6.
14,329.—M'Culloch, J. M'G., "Rotary engines, pumps, blowers, or meters." July 6.
14,349.—Brotherton, E. A., and Wyld, W., "Saturator for the manufacture of sulphate of ammonia." July 7.
14,396.—Lohay, C. G., "Control of mechanism from a distance." July 7.
14,405.—Berry, H., "Suction gas plants." July 7.
14,406.—Levet, H., "Acetylene generators." July 7.
14,431.—Lohay, C. G., "Controlling mechanism at a distance." July 7.
14,470.—Hotton, W., sen., "Inverted gas-lamp carrying one or more mantles." July 8.
14,497.—Becker, W., "Device for controlling from outside whether light is used in a room." July 8.
14,588.—Smith, J., "Purification of gas." July 9.
14,592.—Booth, G., "Automatic cut-off for gas-cocks." July 9.
14,604.—Bolz, C., "Gas-generator." July 9.
14,627.—Dempster, R., and R. & J. Dempster, Ltd., "Guide-rollers, axles, and carriages of spirally guided gasholders." July 10.
14,631.—Fitton, W., "Incandescent burners." July 10.
14,658.—Young, W. T., and Bates, C., "Atmospheric burners." July 10.

"ILLUMINATING TRUTHS."

LEAFLETS FOR DISTRIBUTION.

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."
No. 7.—"The Osram Lamp: Fiction and Fact."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.

Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

Managing Clerk. No. 4967.
Night Foreman. No 4966.
Traveller. No. 4968.

Gas Manufacture and Supply Classes.

Correspondence College Company, Cambridge.

Plant for Sale.

Tank, Tank Waggon, Boilers, Cranes, Engine, &c., &c. W. Johnson, Larkfield.

Plant (Second-Hand) Wanted.

Wet Station Meter. Centenary Air Gas Plant Company.

Patents to Sell or Licences to Manufacture.

Apparatus for Liquefied Gas, &c.
Vapour Burning Apparatus for Incandescent Lighting, &c.
Lamps for Burning Liquid Hydrocarbons, &c. Haseltine, Lake, and Co., Southampton Buildings, London, W.C.
Compressor for Intensified Lighting. Dye, Balham.

Meetings.

Irish Association of Gas Managers. Holywood Town Hall. Aug. 11.
South Metropolitan Gas Company. De Keyser's Hotel. Aug. 2. Two o'clock.
South Suburban Gas Company. De Keyser's Hotel. Aug. 7. Three o'clock.
Tottenham and Edmonton Gas Company. Works. Aug. 8. 3.30 o'clock.
West Ham Gas Company. Liverpool Street Hotel. Aug. 13. 12.30 o'clock.

Stocks and Shares.

Newhaven and Seaford Water Company. Particulars from the Company.

Prospectus.

M.H. (Methane Hydrogen) Gas Plant, Limited.

TENDERS FOR

Coal and Cannel.

Batley Corporation. Tenders by Aug. 15.
Beverley Gas Department. Tenders by July 23.
Clacton Urban District Council. Tenders by July 29.
Haworth Urban District Council. Tenders by July 25.
Ilkeston Gas Department. Tenders by July 24.
Mossley Gas Department. Tenders by Aug. 1st.
New Mills Urban District Council. Tenders by July 28.
Smethwick Gas Department. Tenders by July 29.
Wakefield Gas Company. Tenders by July 29.

Gasholder, Purifiers, Scrubber, Engine and Exhauster, Condenser, Retort-Bench, Fittings, and Furnaces.

Liverpool Corporation. Tenders by Aug. 5.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
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All Communications, Remittances, &c., to be addressed to Walter King, 11, Bolt Court, Fleet Street, London, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
Palmerston House,
Old Broad Street, London, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
Andrew Stephenson, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
Repairs receive prompt attention.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
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SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, Crooked Lane, London, E.C.

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SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated Wm. Pearce & Sons, Ltd.
36, Mark Lane, London, E.C. Works: Silvertown.
Telegrams: "Hydrochloric, London."
Telephone: 341 Avenue.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

LUX'S GAS PURIFYING MASS
See Advertisement on p. 143.
Friedrich Lux, Ludwigshafen-am-Rhein.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

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CARBURINE FOR GAS ENRICHING.

ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, Bishopsgate Street Without,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

BROTHERTON & CO., LIMITED.
Offices: City Chambers, Leeds.
Correspondence invited.

TO Gas Managers, &c., Wanted, Old Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought
J. Wilson, Pleasant Grove, York Road, King's Cross, London, N.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
Brotherton and Co., Ltd., Chemical Manufacturers, Works: Birmingham, Leeds, Wakefield, and Sunderland.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

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CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

PATENTS AND TRADE MARKS
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIA.
Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

GAZINE—A radical Solvent and Pre- ventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
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Telegrams: "Dacolight London." Telephone: 2336 Holborn.

GAS TAR wanted.
Brotherton and Co., Ltd., Tar Distillers.
Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

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ANY QUANTITY. ANY PORT. ANY STATION.
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

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MEADE-KING, ROBINSON, & CO.
Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, Exchange Street, Manchester, and 11, Old Hall Street, Liverpool.

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SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
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Telegrams: Saturators, Bolton. Telephone 0848.

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GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

THE British Bulk Creosote Company,
Borough Road, Weaste, Manchester.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

DESSAU PATENT VERTICAL RETORTS.
FOR list of Installations, see "Journal," July 14, p. I. of Centre.
THE DESSAU VERTICAL RETORT COMPANY,
Care of Mr. Charles Hunt, Consulting Engineer,
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CITY AND GUILDS.
CLASSES in Gas Engineering, Gas Supply, Chemistry, &c.
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NIGHT FOREMAN.
WANTED, immediately, an Ex- perienced General CARBONIZING and WORKS NIGHT FOREMAN, for a Works producing 500 Millions per Annum, one who thoroughly understands Machinery as used in a Gas-Works, and who should have held a similar Appointment elsewhere.
House, Coke, and Gas free.
Apply, stating Age, Wages, &c., required, together with not more than Three *copies* of recent Testimonials, to No. 4966. care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Managing Clerk, well up in Cost Records, Book-Keeping and Commercial Methods, and able to TAKE CHARGE of CLERICAL STAFF. One with Experience in Gas Fitting and Distribution Department Work of Gas Company preferred.
Apply, by letter only, stating Full Particulars and Approximate Salary required, to No. 4967, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

AN Old Established Firm of Gas-Meter Makers require a TRAVELLER, already calling upon Gas-Works in Ireland, to REPRESENT them on Commission.
Apply, by letter only, Stating Terms, Age, Experience, and Line already Representing, to No. 4968, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

No. 4954.
APPLICANTS for the Position of FOREMAN advertised under above No. are THANKED for their Applications, and informed that the position HAS BEEN FILLED.

WANTED, a Second-Hand Wet Station METER, to pass 2000 Cubic Feet per Hour.
The Centenary Air Gas Plant Company, 109, Hope Street, Glasgow.

FOR disposal—
New Steel 50,000-Gallon TANK, Closed Top.
New 300-Gallon Road TANK WAGGON.
New Steel 16 h.p. Vertical BOILER.
New 2-Ton Motor Waggon BOILER.
Second-Hand 2-Ton LOCO-CRANE.
Practically New 10 B.H.P. OIL ENGINE.
Old 8 h.p., Portable STEAM ENGINE.
Second-Hand 100,000-Gallon TANK, open top, in plates.
300 New Creosoted Wood RAILWAY SLEEPERS.
New Bull Dozer PUMP fitted with Pulley 2-inch Suction.
Second-Hand Double-Cylinder Stationary CRANE.
Second-Hand Hand Derrick CRANE, and numerous other TANKS, &c.
Apply W. Johnson, Larkfield, Kent.

WE have the following New and Over- hauled Second-Hand PLANT FOR SALE:—
Gasholders, 30 ft. by 12 ft. New Steel Tank.
" 35 ft. by 10 ft. Cast-Iron Tank.
" *45 ft. by 12 ft.
" *50 ft. by 16 ft.
" *50 ft. by 15 ft. 4 in. (Two-Lift)
*We Can re erect these in Brick or New Steel Tanks.
8-inch, 9-inch and 10-inch Condensers.
New "Cripps" Washer (8-inch), 150,000, c.f. per day.
Walker's Purifying Machine.
Exhausters and Engines, Single and Combined, 2000 to 60,000 feet per hour.
Cast-Iron Tower Scrubber, 7 ft. diameter, 55 ft. high.
Purifiers, sets 6-fts., 10-fts., 12-fts., and 20-fts.
Plans and Quotations of new Sets.
6-inch to 18-inch Station Meters, Governors, &c.
Tar and Liquor Pumps.
Producer-Gas Plants for 150 to 300 H.P.
Boilers, Tanks, and all requisites for Gas-Works.
Firth Blakeley, Sons, and Company, Limited, Gas Engineers, Thornhill, Dewsbury (Yorks.).

THE Directors of the Wakefield Gas- light Company invite TENDERS for the Supply of Best Screened GAS COAL and NUTS required during the ensuing Twelve Months.
Tenders, addressed to the Chairman and Directors, and endorsed "Tender for Gas Coal," to be delivered to the undersigned, not later than Wednesday, July 29 1908.
Forms of Tender may be obtained on Application to
H. Townsend,
Engineer and Manager.
Gas-Works, Wakefield,
July 15, 1908.

BOROUGH OF MOSSLEY.
THE Gas Committee of the Borough of Mossley invite TENDERS for the Supply of GAS COAL.
Specifications and Forms of Tender may be obtained from the undersigned.
Sealed Tenders, endorsed "Gas Coal," and addressed to the Chairman of the Gas Committee, Gas-Works, Mossley, must be delivered not later than the First Post on Tuesday Morning, Aug. 11.
James Taylor,
Engineer and Manager.
Gas-Works, Mossley,
July 14, 1908.

COUNTY BOROUGH OF SMETHWICK.
TENDERS FOR GAS COAL AND CANNEL.
THE Gas Committee inviteTenders for the Supply of about 40,000 Tons of GAS COAL and NUTS, and 1000 Tons of CANNEL.
Form of Tender and further Information may be obtained of the undersigned.
Sealed Tenders, endorsed and addressed to the Chairman of the Gas Committee, Council House, Smethwick, to be sent in not later than the 29th of July inst.
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
W. J. Sturges,
Secretary.
Gas Offices, Council House,
Smethwick.

LIVERPOOL CORPORATION.
FAZAKERLEY GAS-WORKS PLANT.
THE Corporation invite Tenders for the Supply and Erection of the following PLANT:—
Telescopic GASHOLDER, 100,000 cubic feet capacity.
Four 10-feet Square LUTELESS PURIFIERS.
TOWER SCRUBBER, 6 feet diameter by 40 feet high.
WASHER.
GAS or STEAM ENGINE and EXHAUSTER.
Atmospheric CONDENSER.
RETORT BENCH, FITTINGS, and REGENERATOR FURNACES.
Specifications and Forms of Tender may be obtained, and Plans inspected, on Application to the Consulting Engineer, Isaac Carr, M.Inst.C.E., Farnworth, Widnes.
Tenders to be addressed to the undersigned and delivered not later than the 5th of August, 1908.
The Corporation do not bind themselves to accept the lowest or any Tender.
Edward R. Pickmere,
Town Clerk.
Municipal Offices, Liverpool.
July 16, 1908.